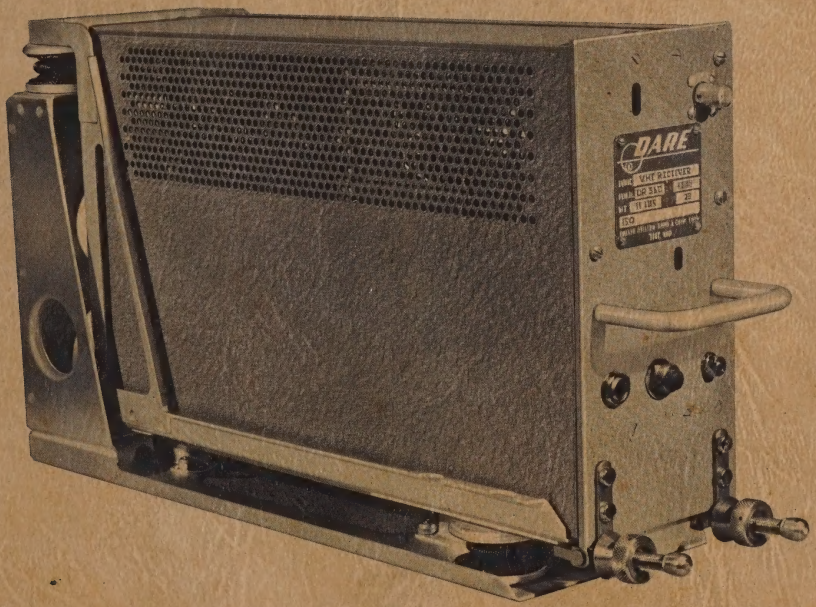
PRELIMINARY

INSTALLATION & SERVICE INSTRUCTIONS



DARE

DN-560 Nav-Comm System

DARE, INC.
TROY, OHIO

INSTALLATION & SERVICE INSTRUCTIONS

DARE DN-560

NAVIGATION COMMUNICATION SYSTEM

DARE, INC.
Troy, Ohio

Preliminary Manual
November 9, 1959

5-2-2. (cont'd.)

e. Trouble - Ledex shaft does not rotate, solenoid runs continuously.

Possible Causes

1. Detent balls do not seat.
2. Slug rack jammed by physical obstruction.
3. Ledex or slug rack bearings out of alignment.

Relay Circuits Trouble Shooting

The DR-560 Receiver contains 3 relays (K601, K602 and K603). The functions of these relays and their electrical connections are clearly outlined in Tables 4-1, 4-2 and 4-3, page 4-13, 4-14 and 4-15.

5-2-3. Alignment and Adjustment Procedure.

Alignment of Tuning Rack

To align the tuning rack on the RF Module, set the control unit to 135 Mc. Loosen the set screws on the coupling unit and cams and rotate the tuning shaft to the point where the 99.995 Mc crystal is making contact. Hold the crystal block tight against the spring contacts and tighten up the set screws in the coupling unit. Set both cams at approximately 3 degrees from the point of maximum throw and tighten up the set screws. Position ledex to 108 Mc and note that the 72.995 Mc crystal is making contact and that the tuning rack is setting at the lowest point. Rotate the ledex 360 degrees several times and stop at position of 135 Mc. Make sure that the ledex does not have a tendency to overthrow.

To align the tuning rack on the HFIF Module set the control unit to .95 MC. Loosen the set screws on the coupling unit, cams and crystal selector shaft. Position the coupling unit and tuning shaft so that the set screws are setting into the flats on the shafts. Tighten the set screws in the coupling unit. Set the rotor blade on the crystal selecting wafer so that the 25.255 Mc crystal is making contact. Tighten up the set screws in the crystal selector shaft. Set both cams at approximately 3 degrees from the point of maximum throw and tighten up the set screws. Position the ledex to .00 Mc and note that the 24.305 Mc crystal is making contact and that the tuning rack is setting at the lowest points of the cams.

DARE, INC.

DAYTON AVIATION RADIO & EQUIPMENT CORPORATION

TROY, OHIO

WARRANTY

DARE, INC., warrants each new electronics product manufactured by it to be free from defects in material and workmanship under normal use for a period of one (1) year from date of installation by a DARE-authorized sales and service outlet. All vacuum tubes, transistors and crystals shall be warranted for a period of ninety (90) days from date of installation. DARE, INC., limits itself under this Warranty to repair or replace at the factory any parts returned to us, transportation charges prepaid, which shall prove, after examination by DARE, INC., representatives, to have been defective in manufacture. This Warranty is limited to the original customer as verified by DARE, INC., or a DARE-authorized Distributor.

This Warranty is void with respect to equipment that is altered, modified, or repaired except by DARE, INC., or its designated Sales and Service Distributors, and shall not extend to equipment that has been damaged from any cause. In no event shall DARE, INC., be liable for special, exceptional, or consequential damages or any loss or expense arising directly or indirectly from the sale or use of DARE equipment or its failure to perform either separately or in combination with other apparatus or from any other cause, except to the extent as stated in this Warranty. DARE, INC., shall not be responsible for equipment which has been subject to misuse or accident, or which has had the serial number effaced or removed, or which has been installed or used in other than accordance with the Manufacturer's instructions.

DARE, INC., reserves the right to make design changes, additions to, or improvements in its products without imposing any obligation upon itself to install such changes, additions, or improvements in products of prior manufacture.

IT IS AGREED THAT THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, MADE BY THE MANUFACTURER EXCEPTING THE MANUFACTURER'S WARRANTY AGAINST DEFECTIVE MATERIALS OR WORKMANSHIP AS STATED IN THIS WARRANTY.

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SECTION I

GENERAL DESCRIPTION

1-1. Purpose of Equipment

The DARE DN-560 Navigation System is a complete Omni/Localizer Navigation System and Communications Receiver. It covers the range of 108 Mc through 135.95 Mc in 50 Kc increments.

1-2. Equipment Furnished

The following equipment, plus mating connectors for DR-560, DNC-4 and DNI-2 is furnished with the system. Components are available for either 13.75 or 27.5 VDC aircraft power. Specify voltage when ordering.

DARE Model No.	Quantity Required	Item	Net Weight
DR-560	1	Navigation and Communication Receiver	11.00 lbs.
DNC-4	1	Navigation Converter	3.25 lbs.
C/560GS	1	Control Unit	0.70 lb.
DNI-2	1	Navigation Instrument	3.25 lbs.
M/DR-560	1	Shockmount	1.80 lbs.
M/DNC-4	1	Shockmount	1.25 lbs.

1-3. Equipment Required, But Not Furnished

The following equipment must be supplied at the time of installation, if not already included in the aircraft equipment. For details, see Section II, Installation.

1 - Communication and/or Navigation Antenna
1 - Wiring harness, as required

1-4. Description of Components

1-4-1 DR-560 Receiver

Crystal controlled, 560 channels with 50 Kc spacing from 108.00 to 135.95 Mc.

Internal 13.75 or 27.5 V DC transistorized power supply. Current drain 1.6 Amps at 27.5 V or 2.9 Amps at 13.75 V. No other external power required.

1-4-1. (cont'd.)

Double conversion receiver with a variable tuned first IF of 35.05 to 35.95 Mc and fixed tuned 10.7 Mc second IF.

Receiver is of modular construction for serviceability.

Rear connector wired as per ARINC Report 406, List 12B allowing interchangeability with other receivers and test harnesses.

Pertinent performance specifications include:

a. Sensitivity.

A 2 microvolt r-f input signal modulated 30% 1000 cycles will produce a 6 db S / N/N ratio.

A 2 micro volt r-f input signal modulated 30% 1000 cycles will produce 50 milliwatts of audio at a nominal impedance of 600 ohms. The audio output is adjustable by means of a built in level control from 0 to 300 milliwatts maximum.

A 3 micro volt r-f input signal modulated with standard omni signal will produce .72 volts at omni output. The omni output is adjustable by means of a built in level control from 0 to .9 Volts. This output is approximately / 7 degrees out of phase with the demodulated signal of the signal generator.

b. Selectivity.

40 Kilocycles maximum bandwidth at 6 db down points.
75 Kilocycles maximum bandwidth at 60 db down points.

c. Stability

The receiver stability is well within 0.01% under all service conditions.

d. Automatic Gain Control

Audio output is flat within 3 db total variation from 2 microvolts to 20,000 microvolts input.

1-4-1. (cont'd.)

e. Audio Fidelity

Within 6 db. 350 to 2500 cps

f. Noise Limiter

A series diode peak clipping type limiter is provided in the receiver.

g. Squelch Circuit

An audio squelch circuit with an adjustable threshold is provided.

1-4-2. DNC-4 Navigation Converter

Fully transistorized omni range and localizer navigation converter.

Utilizes audio signal from the DR-560 Receiver to provide indications on the DNI-2 Indicator.

Signal input of 0.5 volts rms of combined signal will produce full sensitivity. Compatible with other receivers.

Standard outputs for 3 flight path deviation movements, 2 flag alarm movements and 1 to/from movement.

Compatible with automatic flight control couplers.

Power requirements, 13.75 or 27.5 volts DC at less than 300 ma.

Standard 1/2 height, short 1/4 ATR case size.

1-4-3. C/560 GS Control Unit

ARINC drum type control with large numerals.

Internally lighted.

1-4-3. (cont'd.)

Provides 560 channel selection with concentric volume control and off/on switch.

Additional wafers on the control provide automatic switching and channeling for a 20 channel glide slope receiver when the system is tuned to an ILS localizer channel.

Omni, localizer or communication functions are automatically controlled when the proper channel is selected.

1-4-4. DNI-2 Navigation Instrument

Conventional 3-1/8" instrument combining the omni bearing selector, flight path deviation needles, to/from indicator and flag alarms for the glide slope and omni/loc. needles.

Standard ARINC Autosyn Resolver.
Standard Meter Movements: Flight path deviation, (2) 1000 ohm, 150-0-150 microamp. To/From, 333 ohm, 135-0-135 microamp.
Flag alarm, 1000 ohm, 0-250 microamp.

1-4-5. M/DR-560 Shockmount

For normal vertical mounting of receiver. This mount is a short 3/8 ATR type with a mating connector for the receiver.

1-4-6. M/DNC-4 Shockmount

For normal vertical mounting of the converter. This mount is a half-height short 1/4 ATR type with a mating connector for the converter.

SECTION II

INSTALLATION

2-1. General Installation Information

The location of the various components will vary with each aircraft. All units should be located so they are available for inspection and maintenance. Specific considerations for each component are as follows:

2-2. DR-560 Navigation Receiver

Should be installed in an area that is reasonably accessible and well ventilated. The standard M/DR-560 shockmount is utilized, allowing the receiver to be mounted vertically. When mounting the rear connector on the shockmount, the connector should always be mounted on the front side of the mount to insure full contact of the pins. The opening in the mount is large enough to permit the plug to pass through for ease of assembly after cables have been soldered in place.

The receiver is contained in a short 3/8 ATR case. Figure 2-1, page 2-2 shows the outline dimensions and mounting dimensions of the receiver mounted on its shockmount M/DR-560. The shockmount should be secured to the radio shelf by means of No. 10 screws, nuts and lock washers.

Antenna connections are made by means of a type BNC connector on the front panel. However, facilities are available for antenna connections through the rear connector. Table 2-1 in this section shows the receiver pin connections and their appropriate functions.

CAUTION:

Facilities are available for a panel mounted squelch button. A normally closed push button switch can be used for this purpose. If no squelch button is desired, Pin No. 25 on the receiver connector must be grounded for proper operation of the squelch circuit.

2-3. C560/GS Control Unit

The C560/GS Control Unit is designed for usage with a DR-560 Receiver and a 20 channel ARINC Glide Slope Receiver.

The control unit may be mounted in either of two ways. The control unit may be mounted on the front of the airplane's radio control panel or it may be mounted as an integral part of the radio control panel.

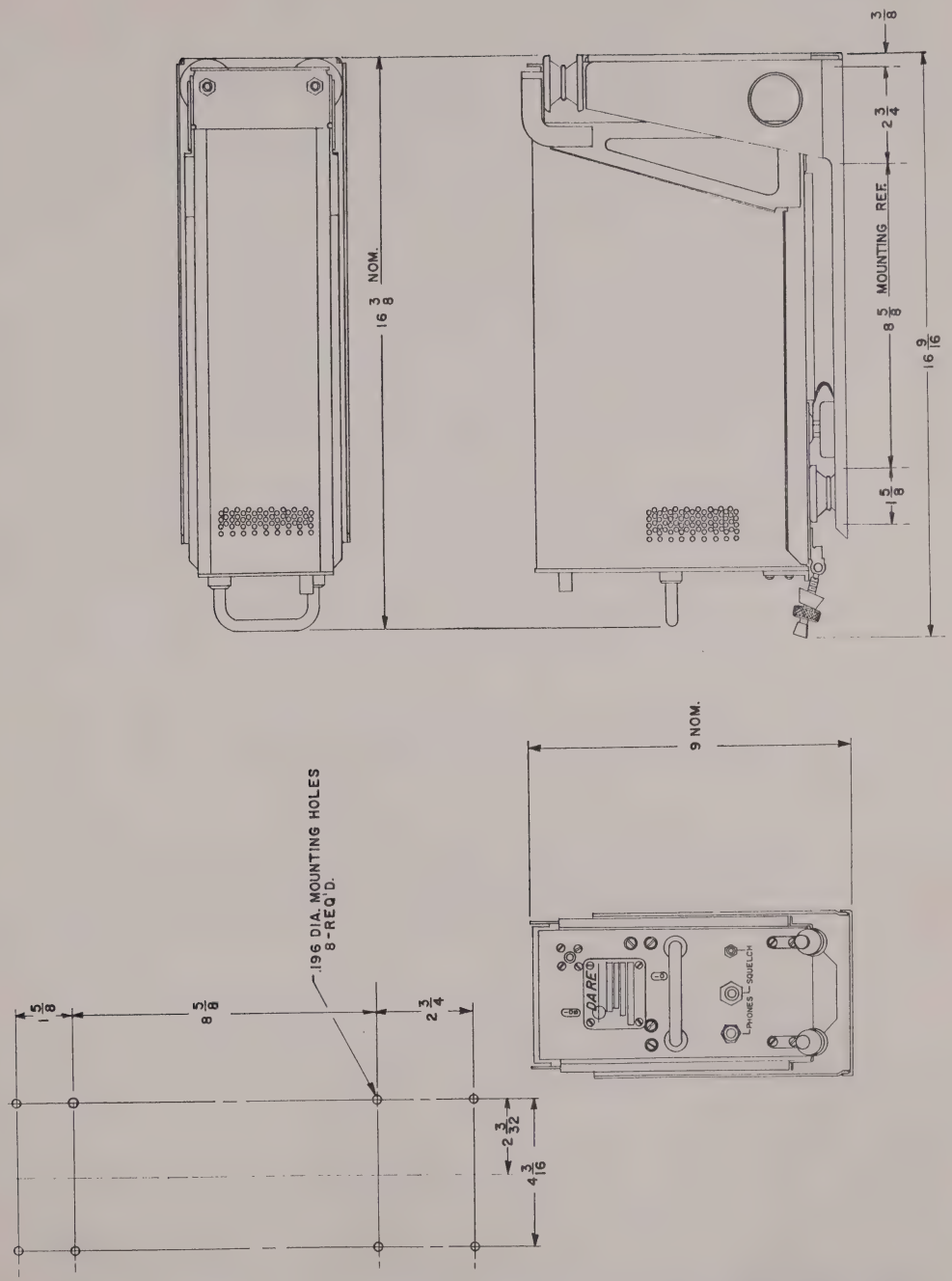


Figure 2-1 DARE Navigation Receiver DR-560, Outline and Installation Details

2-3 (cont'd)

Figure 2-4, page 2-6 shows the outline dimensions and mounting dimensions for this control unit. A Schematic Diagram Figure 7-2, page 7-2 should be used in conjunction with Table 2-1, page 2-7 for correct wiring of the DR-560 Receiver plus a standard ARINC Glide Slope Receiver.

2-4 DNC-4 Navigation Converter

The DNC-4 Converter should be installed in an area that is reasonably accessible, well ventilated and as close to the DR-560 Navigation Receiver as possible. The standard M/DNC-4 shockmount is utilized. The converter is contained in a half height short 1/4 ATR case. The shockmount should be secured to the radio shelf by means of No. 10 screws, nuts and lock washers. Figure 2-2, page 2-4 shows the outline dimensions and mounting dimensions of the converter and shockmount.

Standard outputs for 3 flight path deviation movements, 2 flag alarm movements and 1 to/from movement are available. However, the unit is set up for 1 flight path deviation movement, 1 flag alarm movement and 1 to/from movement when received from the manufacturer. To be able to utilize the full capabilities, there are 2 shorting bars located on the front of converter chassis which can be positioned to select up to 3 standard deviation movements and/or 2 flag alarm movements.

All wiring connections are made through the converter's rear connector. Table 2-2, page 2-8 shows the converters pin connections and their functions.

2-5 DNI-2 Navigation Instrument

The DNI-2 Instrument can be installed in any type of aircraft with a minimum of time and effort. The DNI-2 Instrument's mounting surface is designed to AN Design Standard No. AND10402 which allows standard mounting dimensions for panel installation.

Figure 2-3, page 2-5, an outline drawing of the DNI-2 is given for physical dimensions. All wiring connections are made through the instruments rear connector. Table 2-3, page 2-9 shows the pin connections and their functions.

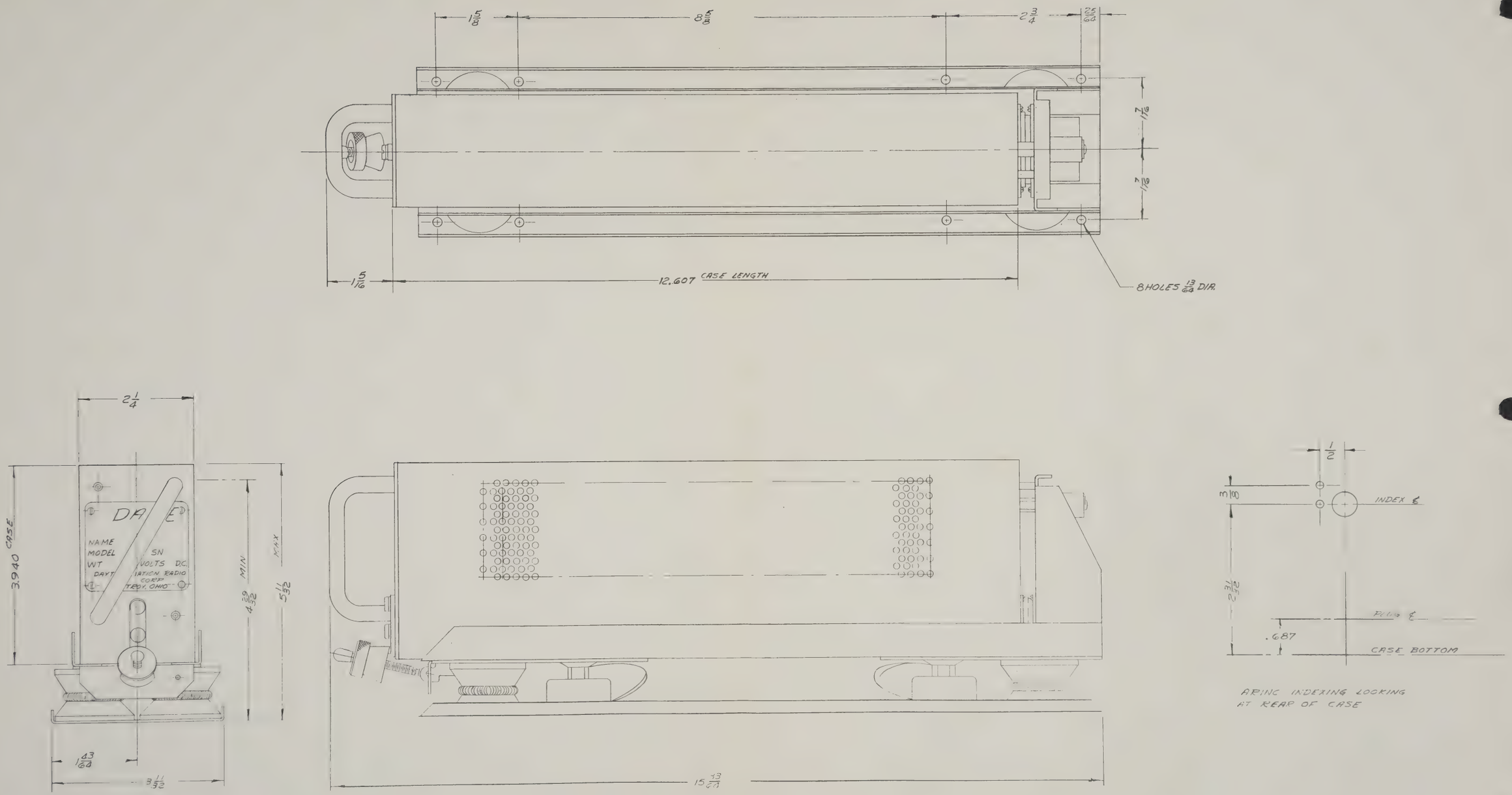


Figure 2-2 DARE Navigation Converter DNC-4, Outline and Installation Details

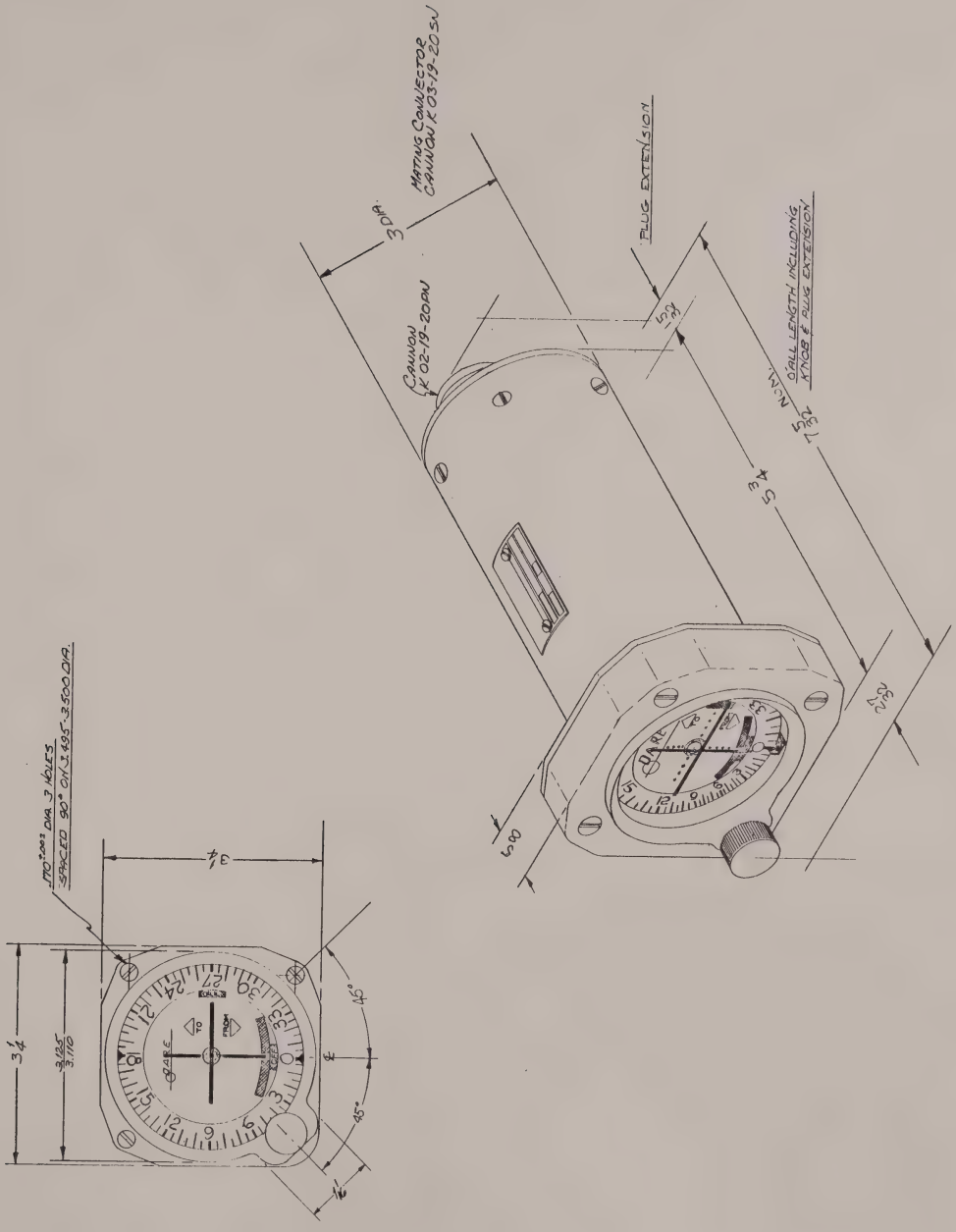


Figure 2-3 DARE Navigation Instrument DNI-2, Outline and Installation Details

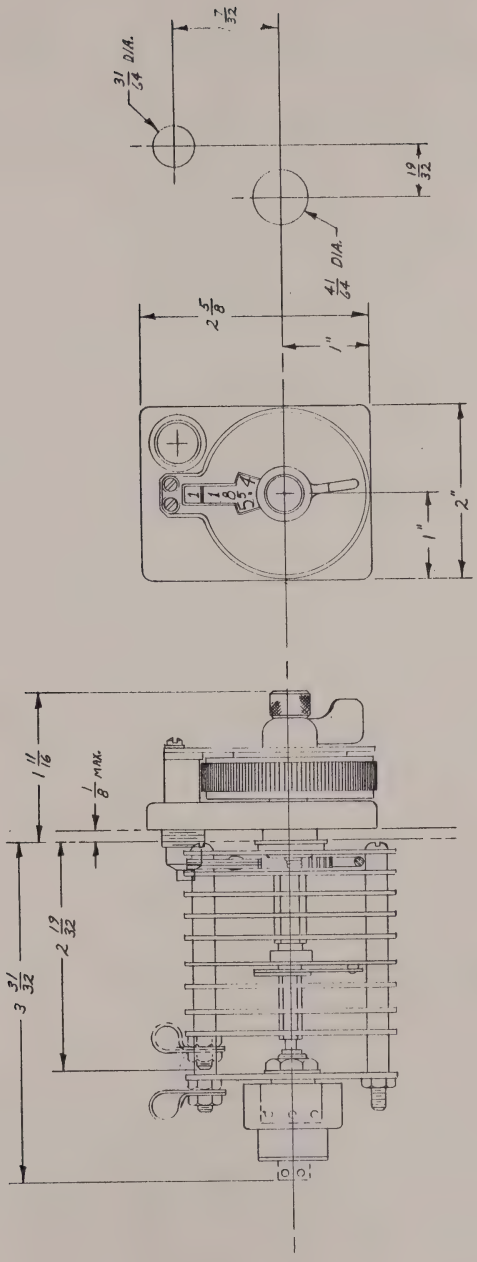


Figure 2-4 DARE Control Unit C/560GS, Outline and Installation Details

TABLE 2-1
DR-560 Navigation Receiver Pin Connections

Connector Type: DPA-29C1-33S

PIN NO.	FUNCTION
1	Spare
2	13.75 V or 27.5 V Input
3	Spare
4	Audio Output (≠ Phase)
5	Audio Output (- Phase)
6	Wire "A" Unit MC Control
7	Wire "B" Unit MC Control
8	Wire "C" Unit MC Control
9	Wire "D" Unit MC Control
10	Wire "E" Fractional MC Control
11	Wire "F" Fractional MC Control
12	Wire "G" Fractional MC Control
13	Wire "H" Fractional MC Control
14	Wire "J" Unit MC Control
15	Wire "K" Fractional MC Control
16	Wire "L" Fractional MC Control
17	Wire "M" Unit MC Control
18	Omni Output
19	Nav. - Com. Antenna Transfer Relay
20	Spare
21	AGC
22	Ground
23	A ≠ Receiver Disabling
24	Spare
25	Remote Squelch Button
26	B ≠
27	A ≠ Glide Slope Receiver on Standby Relay
28	Spare
A1	Coax Antenna Input

NOTE:

1. No. 22 AWG wire is suitable for all frequency control wires.
2. All audio connections should be made with No. 22 shielded wire.
3. A ≠ connections should be made with at least No. 14 AWG wire on 13.75 volt operation and No. 16 AWG wire on 27.5 volt operation.

TABLE 2-2

DNC-4 Navigation Converter

Connector Type: DPA-32-33S

PIN NO.	FUNCTION
1	Spare
2	Spare
3	Spare
4	Spare
5	Spare
6	Spare
7	Spare
8	Spare
9	Spare
10	Spare
11	Spare
12	Spare
13	Spare
14	Spare
15	Spare
16	Spare
17	13.75 V or 27.5 V Input
18	Ground
19	Resolver Rotor
20	Resolver Stator
21	Resolver Stator
22	VOR-ILS Deviation
23	VOR-ILS Deviation
24	Spare
25	A ≠ VOR-ILS Relay
26	Resolver Rotor Common
27	Resolver Stator Common
28	VOR-ILS Flag ≠
29	VOR-ILS Flag -
30	To - From (To ≠)
31	To - From (From ≠)
32	VOR-ILS Signal Input

NOTE:

1. All audio connections (Pins 19, 20, 21 and 32) should be made with #22 shielded wire.
2. A ≠ connections should be made with #20 AWG wire.
   All other connections should be made with #22 AWG.

TABLE 2 - 3
DNI-2 Navigation Instrument Pin Connection

Connector Type: KO3-19-20SN

PIN NO.	FUNCTION
A	Rotor
B	Rotor Common
C	Stator
D	Stator
E	Stator Common
F	VOR-ILS Deviation ≠ Right
H	VOR-ILS Deviation ≠ Left
J	To - From ≠ From
K	To - From ≠ To
L	Glide Slope Flag -
M	Ground
N	Spare
P	Spare
R	VOR-ILS Flag Flag ≠
S	Glide Slope Deviation ≠ Up
T	Glide Slope Deviation ≠ Down
U	Glide Slope Flag ≠
V	Spare
W	Spare
X	VOR-ILS Flag -

SECTION III

OPERATION

3-1. General

The DARE DN-560 Navigation System is a remote controlled system, operated from the aircraft's radio panel with a nominal number of controls. Reception on 560 separate channels covering every .05 Mc from 108.00 Mc to 135.95 Mc is provided.

The C560/GS Control Unit plus a remote squelch button are the only external controls for operation of this system.

3-2. Operating Controls

The setting of dials on the Control Unit C560/GS determines the operating frequency. The dials associated with the two knobs combine to read frequency directly in megacycles and .05 megacycles. Checking of the frequency controls can be accomplished by seeing that the numbers shown in the dial windows on the receiver correspond with the frequency selected by the control unit.

The volume control and OFF-ON switch is mounted concentrically with the frequency selector knobs. The initial turn of the knob energizes the receiver and the converter. Further rotation increases the audio out put level of the receiver.

To check operation of the receiver with no signal input, press the squelch button and a distinct noise level should be heard through the speaker system or earphones.

The automatic selection of glide slope frequencies is accomplished through the additional wafers on the C560/GS Control Unit. This unit selects the glide slope frequencies in accordance with ARINC specifications on Localizer-Glide Slope pairings. See Table 3-1, page 3-5 for frequency pairing chart. The converter is automatically changed to localizer operation when these frequencies are selected. This is accomplished through a relay system in the receiver and converter.

The DNI-2 Navigation Indicator contains the Omni Bearing Selector. The desired omni-bearing is selected by the OBS knob on the bottom left side of the DNI-2 and the bearing selected is determined by the rotating azimuth ring and the arrow at the bottom of the instrument face.

3-3. DNI-2 Indicator Operation

See the Operation Chart Figure 3-1, page 3-4.

To/From Indicator and Vertical Needle

A To/From indicator, indicates whether the omni bearing selected is the course to or from the omni-range station.

The DNI-2 vertical needle indicates an on or off course condition regardless of the aircrafts heading. The following positions of the vertical needle and the To/From indicator are important.

(a) The vertical needle will be centered when the aircraft is on the course selected by the azimuth ring and a To indication will be present.

(b) With a To indication, an off course indication, and flying toward the station, the needle points in the direction of the omni bearing line selected.

(c) With a From indication, an off course indication, and flying away from the station, the needle points in the direction of the omni bearing line selected.

FLAG ALARMS

Two flag alarms are present on the indicator's face. The flag alarm at the bottom center is associated with the vertical needle. The flag alarm at the right center is associated with the horizontal needle. These flag alarms will come into view when ever the signal levels fall below a value large enough to assume proper operation.

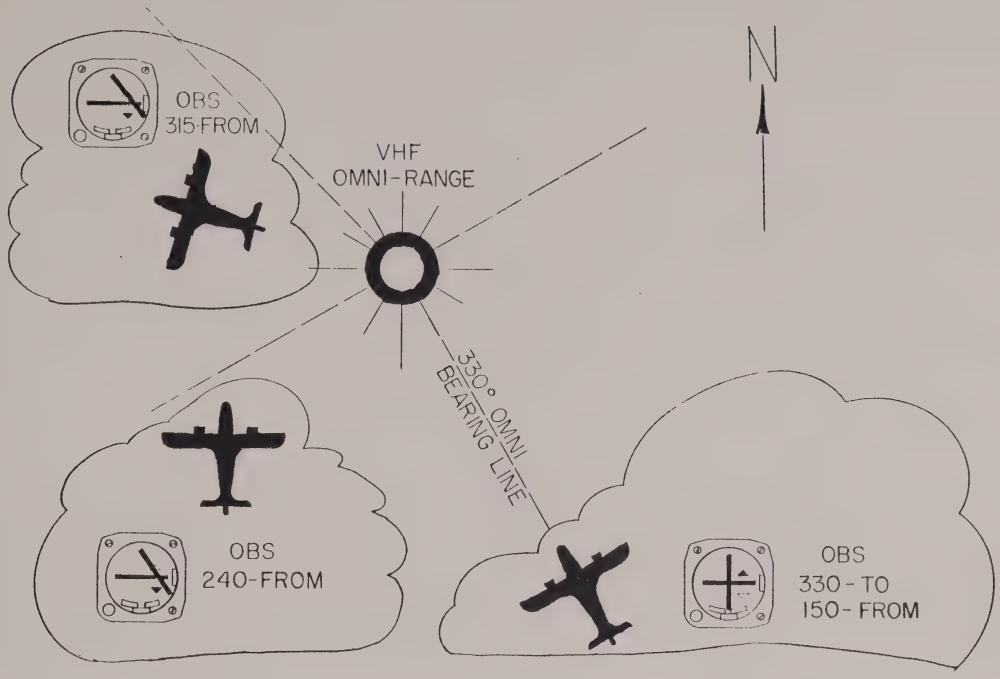
HORIZONTAL NEEDLE

The horizontal needle is operated in conjunction with a glide slope receiver and for operation, the instruction book for the glide slope receiver should be consulted.

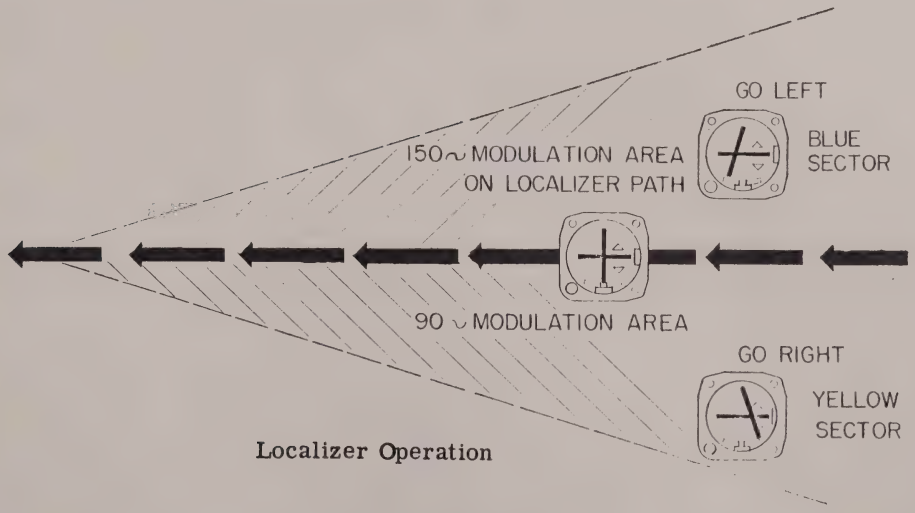
3-3. (con't.)

LOCALIZER OPERATION

During localizer operation and flying a normal approach, the vertical needle will give an on or off course indication. If the vertical needle is in the yellow sector, it indicates a course to the left of center and the aircraft should fly to the right. If the vertical needle is in the blue sector, it indicates a course to the right of center and the aircraft should fly to the left.



Omni Operation



Localizer Operation

Figure 3-1 DARE Navigation System DN-560, Operation Chart

TABLE 3 - 1

Frequency Channel Pairing Plan

ILS FREQUENCY Mc	GLIDE SLOPE FREQUENCY Mc	CHANNEL Desig.
108.1	334.7	1 B
108.3	334.1	2 B
108.5	329.9	3 B
108.7	330.5	4 B
108.9	329.3	5 B
109.1	331.4	6 A
109.3	332.0	7 A
109.5	332.6	8 A
109.7	333.2	9 A
109.9	333.8	10 A
110.1	334.4	1 A
110.3	335.0	2 A
110.5	329.6	3 A
110.7	330.2	4 A
110.9	330.8	5 A
111.1	331.7	6 B
111.3	332.3	7 B
111.5	332.9	8 B
111.7	333.5	9 B
111.9	331.1	10 B

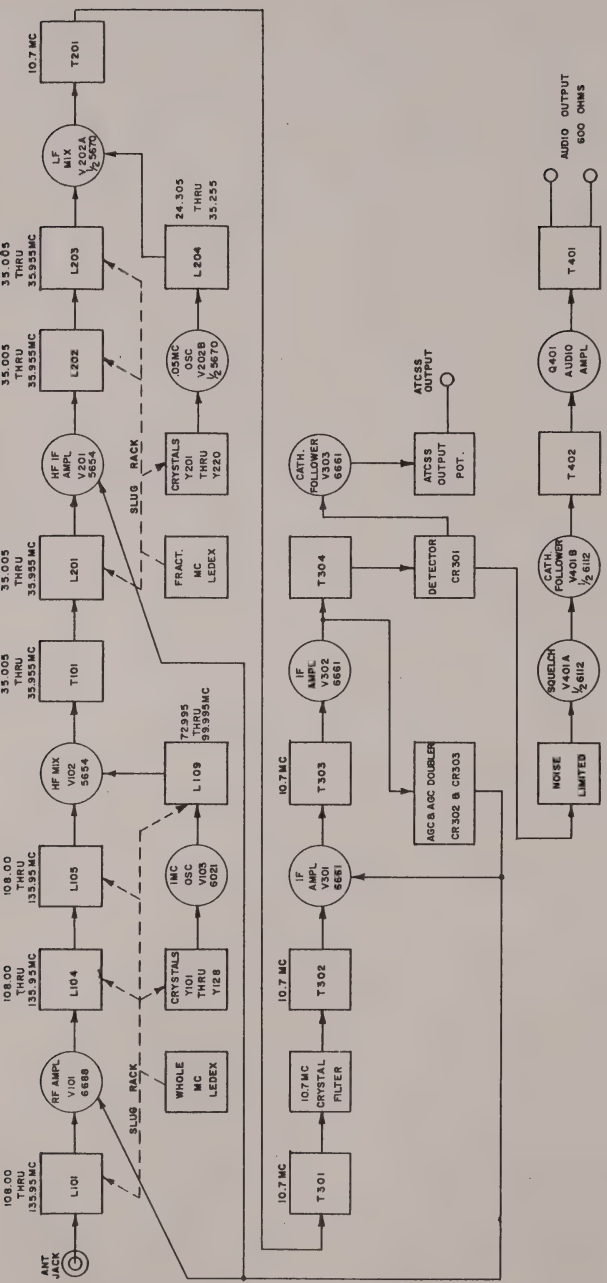


Figure 4-1 DARE Navigation Receiver DR-560, Block Diagram

SECTION IV

PRINCIPLES OF OPERATION

4-1. General Information

The DARE DN-560 system will receive amplitude modulated navigation or communication signals on any of 560 channels in the frequency range of 108.0 to 135.95 Mc. The DR-560 Navigation Receiver Block Diagram, Figure 4-1, page 4-1 and the DNC-4 Navigation Converter Block Diagram Figure 4-2, page 4-6 represents a broad picture of the operation of the various electrical and mechanical elements of the system. Figure 7-3, page 7-3 and Figure 7-10, page 7-10 are complete schematic diagrams of the receiver and converter.

4-2. DR-560 Navigation and Communication Receiver

The receiver consists of five modules which are readily removable. These modules are RF, HFIF, LFIF, Audio and Power Supply. Schematic diagrams for each module is given in Section 7. Apart from the separate modules there are three (3) relays and a voltage regulator in the unit package. In Table 4-1, 4-2, and 4-3, on page 4-13, 4-14 and 4-15, there are detailed descriptions of the relays and their functions. The Voltage Regulator (V601) is a 95 volt regulator. This regulated voltage is used for screen supplies in the RF, HFIF and LFIF modules. There are four (4) test points for A $\neq$, AGC, B $\neq$ and B $\neq$ regulated readily available on the front top portion inside the dust cover.

4-2-1. RF Module

The r-f signal is fed to the receiver and R-F Module through J609 to J101. This signal is amplified by RF Amplifier (V101) then fed to the HF Mixer (V102). The oscillator injection voltage for this mixer is generated by HF Oscillator (V103). This oscillator is a conventional Butler type, crystal controlled with 5th overtone crystals. With an oscillator frequency from 72.995 - 99.995 Mc we convert to 35.005 - 35.955 Mc.

The r-f amplifier grid and plate, the mixer grid and the oscillator plate are automatically tuned by a tuning rack which is positioned by means of the 28 position ledex mechanism.

The output of this module (35.005-35.955 Mc) is fed to the HFIF Module through J201.

4-2-2. HFIF Module

The r-f signal is amplified by HF Amplifier (V201) and then fed to LF Mixer (V202A). The oscillator injection voltage for this mixer is generated by the LF Oscillator (V202B). This oscillator is a conventional type with a fixed tuned plate and crystal controlled with 3rd overtone crystals. With an oscillator frequency of 24.305 - 25.255 Mc we convert to 10.7 Mc for a fixed IF frequency. This oscillator is tuned by positioning of the slug in L204. The h-f amplifier grid and plate and the mixer grid are automatically tuned by a tuning rack which is positioned by means of the 24 position ledex mechanism.

The output of this module (10.7 Mc) is fed to the LFIF Module through J302.

4-2-3. LFIF Module

The input to the LFIF Module is fed through an input transformer to a 10.7 Mc Crystal Filter. The only tuning necessary in the filter circuit are the input and output transformers T301 and T302. These transformers are tuned for peak sensitivity plus the elemination of ripple response. This crystal filter has a 40 Kc band width at 6 db points with a 3 db or less ripple factor.

From the crystal filter the 10.7 Mc signal is amplified by the first IF amplifier (V301). The signal is then coupled by T303 to the second IF amplifier (V302). The output of the second IF is coupled by T304 to the audio detector demodulating circuits.

The audio output off of the detector is utilized in two ways. Directly off the detector the audio is fed to the Audio Module. The audio is also fed to a Cathode Follower (V303). There is a 2500 ohm potentiometer in the cathode circuit which controls the omni output. This output is approximately ⁄ 7 degrees out of phase with the demodulated signal of the signal generator.

The plate of the second IF Amplifier (V302) is connected to the AGC detector diode (CR302) through C312. A predetermined bias is placed on this diode to prevent AGC voltage from being developed until a sufficiently strong signal is received. During the first half of the input cycle C312 is charged through CR302. This charge is then added through CR303 to the charge on C316 on the next half cycle, both charges being developed as AGC voltage across R311. This AGC voltage is used to

4-2-3 (cont'd.)

control V101, V201, V301 and the squelch tube V401A. A relay is utilized to change the AGC time constant during the navigation frequency portion.

4-2-4. Audio Module

The audio signal is fed to the Audio Module through Pin 9 of P401. This signal goes through the Noise Limiter (CR402) which has its plate biased positive through R416 and R413 by the diode load voltage. The audio signal developed across R412 and R414 is connected to the cathode of the diode. Since the r-f modulation on the navigation frequencies is much lower than that on the communication frequencies, R415 is switched in the circuit during communication frequency to allow approximately the same levels of limiting action. When a positive pulse of noise is present in the detected audio it is coupled with the audio signal to the cathode of the noise limiter diode. Due to C407 the plate voltage will remain constant during the duration of the noise pulse and the diode is driven to cutoff by the increased positive cathode voltage. When the noise pulse is gone the diode bias returns to normal. Since the recovery time of the limiter is very short and the noise pulse is of a short duration, the limiting of audio during noise pulses is not audible.

From the limiter the audio goes through C405 to the squelch circuit. V401A is a D.C. Amplifier used to bias a silicon diode CR401. In the static condition V401A is conducting, allowing the diode to be cut off due to reverse bias. The squelch control potentiometer R604 is set so as to allow conduction with no r-f signal into the receiver. When a r-f signal is received and AGC voltage is developed, this voltage is placed on the grid of V401A cutting it off. When the squelch tube is cut off, CR401 is forward biased allowing the audio signal to be passed to the grid of the Cathode Follower (V401B). The squelch button is in series with the squelch control potentiometer R604 and when this switch is open it places sufficient bias on the cathode, allowing the squelch circuit to open. This squelch button is connected to Pin 25 of P606 to facilitate the useage of an external squelch button. When an external squelch button is not used Pin 25 must be grounded.

Through the Cathode Follower (V401B) the audio signal is placed across the primary of T402. The secondary of T402 is connected to Audio Amplifier (Q401). This stage is a Class "A" amplifier utilizing a 2N158A transistor. This amplifier is connected to T401 which is the output transformer. Q401 will supply 0 to 250 milliwatts of output to a nominal 600 ohm load depending upon the setting of R406, the volume control, when

4-2-4 (con'd.)

a normal voice modulated signal is received at the antenna.

4-2-5. Power Supply Module

The A ≠ input surge and hash filter consists of L501, C501 and C502. The square wave oscillator includes two transistors (Q501 and Q502), the primary and control windings of T501 and resistors R501 and R502.

This oscillator performs much the same function as does a vibrator in a vibrator power supply. That is, the primary power is applied alternately across the primary windings.

To follow one cycle of operation, consider A ≠ current flowing through one section of the primary winding, through Q501 emitter to collector and ground. Since the polarity of the transformer is such as to aid the conduction of Q501 and cut off Q502 the voltage across the primary approximates a saw tooth wave. The core of T201 has the form of a rectangular hysteresis loop and is easily saturated. When the current through Q501 and transformer is large enough to saturate the core, transformer action ceases. When this happens the control winding voltage disappears. The Q501 current decreases bringing the core out of saturation plus changes the control winding polarity. At this time Q502 begins conducting and Q501 is immediately cut off. This cycle repeats at a rate of approximately 1000 cps. The voltage divider R501 and R502 biases the transistors to provide proper starting conditions. The T201 secondary windings provide square wave voltages of approximately 200 volts peak. The bridge rectifier circuit CR501, CR502, CR503 and CR504 rectifies the pulsating square wave and the output voltage is filtered by C503.

R504 is added to insure a minimum load and as a safety feature to discharge C503. Very little filtering is necessary due to the square wave output of the transformer.

Should a B ≠ short occur the design is such as to cause the oscillator to assume a very high frequency and the input current will drop to a very low level.

B ≠ voltage is approximately 180 volts under normal current drain of 90 milliamperes. To measure the actual current drain, measure the voltage drop across R503 and multiply by 10. This gives the actual current drain in milliamperes.

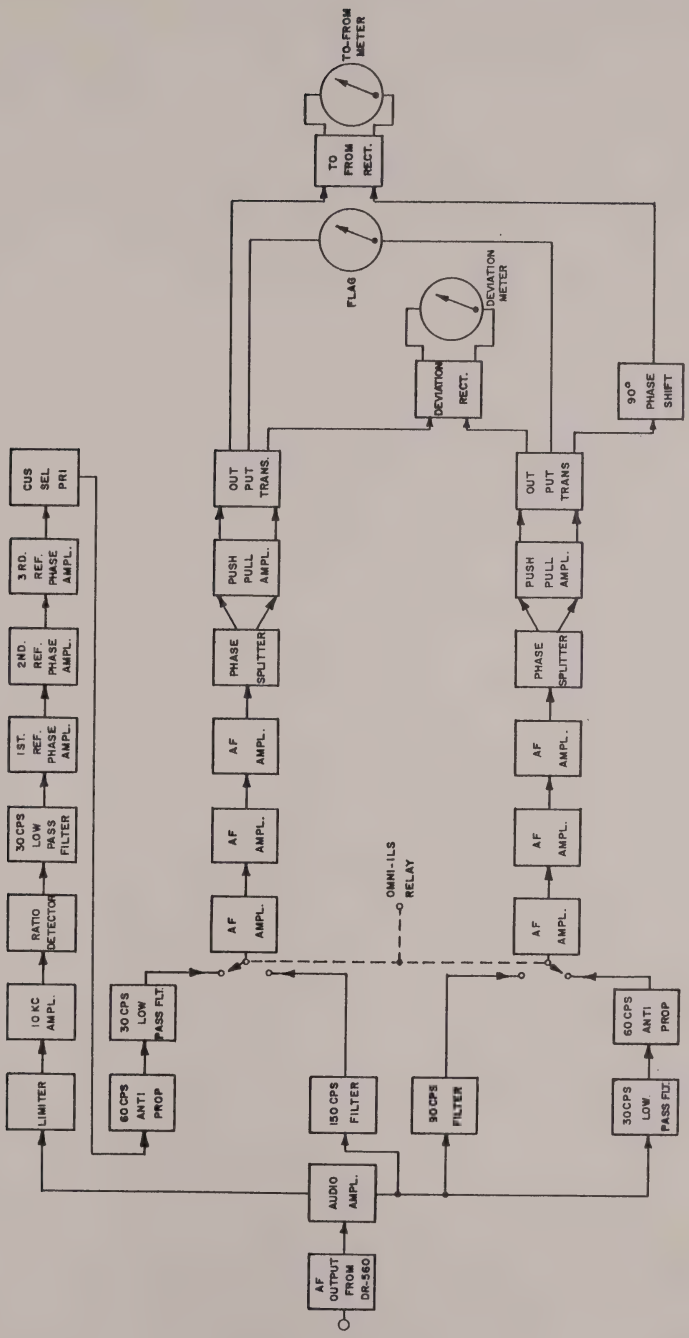


Figure 4-2 DARE Navigation Converter DNC-4, Block Diagram

4-3. DNC-4 Navigation Converter

The DNC-4 Navigation Converter's Block Diagram Figure 4-2, page 4-6 and Schematic Diagram Figure 7-10, page 7-10 should be referred to when considering the principles of operation. The converter is completely transistorized utilizing either the 13.75 or 27.5 volts supply. The variations between the 13.75 volt and 27.5 volt units are the values of R107 and the resistance values of K101 and K102.

4-3-1. Input Circuits

The omni signal from the DR-560 Receiver is fed into the converter through Pin 32 of P102 then to Pin 8 of P101. This audio is fed to the Input Amplifier (Q201) through the Input Level Control R101. This is a common collector circuit which allows a low impedance output to drive the Variable Phase Amplifiers and the Reference Phase Recovery circuits. The output of this circuit is fed to the different functional sections of the converter.

4-3-2. Reference Phase Recovery Circuits

The F-M signal (9960 CPS) is fed to the limiter diodes CR301 and CR302 through coupling capacitor C301. These diodes are clipping the negative and positive peaks of the F-M signal to prevent any amplitude change into the Phase Discriminator. This signal is fed to the Class A Amplifier Q301 through C302. The output of Q301 is the primary of T105 the Phase Discriminator transformer. The primary and secondary are tuned to 9960 CPS by means of C103, C304, C306 and C104. C103 and C104 are selected capacitors between the range of .015 - .04 microfarads. This transformer is tuned for maximum undistorted signal at the junction of C307 and R308.

R308, C308, R309, C309 and R310 make up a low pass filter for 30 cps. C310 is a coupling capacitor to a three stage 30 cps direct coupled amplifier (Q302, Q303 and Q304). The output of this amplifier is coupled by C314 to the rotor of the indicator resolver through Pin 19 of P102.

4-3-3. Reference Phase Amplifier

The output of the Indicator (DNI-2) resolver is fed to the phase splitting network R402 and C401 through Pins 20 and 21 of P102. R402 is a selected value for tracking through 360°. The signal is then fed through a 60 CPS anti prop. modulation filter, then through a 30 CPS low pass filter consisting of R403 and C402. The signal is then fed through R404 which is a selected resistor to control the input

4-3-3- (cont'd.)

to the Reference Phase Amplifiers. The value of this resistor is selected to produce 3 VRMS across half of the primary of T101. This resistor value ranges between 500 - 2K ohms. The signal is then fed to the four stage direct coupled Reference Phase Amplifier (Q401, Q402, Q403 and Q404) through K102C and C404. R412 is a 500 ohm thermistor used for temperature compensation of the four stage amplifier. Q404 is a Phase Splitter coupled through C409 and C410 to the Push-Pull Output Amplifier Q405 and Q406 which drives output transformers T101 and T102. R422 is a 3000 ohm thermistor used for temperature compensation of the push-pull amplifier Q405 and Q406. Further discussion on T101 and T102 will be considered in the metering circuits portion.

4-3-4. Variable Phase Amplifier

The 30 cps variable phase signal is connected directly to the phase adjust circuit from the Input Amplifier Q201. The phase adjust circuit consist of R110 and C202. From the phase adjust circuit the signal goes through a 30 cps low pass filter which consists of R204, C203 and R205. The signal then passes through a 60 cps anti prop. modulation filter which is the same as in the Reference Phase Amplifier circuit. The signal is then passed through an isolation and filter load resistors R102 and R103. R102 is a selected resistor which is selected to give 2 VRMS across half the primary of T103.

The 30 cps signal is then coupled through K102A and C204 to a four stage direct coupled Variable Phase Amplifier (Q202, Q203, Q204 and Q205). This amplifier is identically the same as the four stage Reference Phase Amplifier and it also drives a Push-Pull Amplifier Q206 and Q207. This output stage drives transformers T103 and T104.

4-3-5. Metering Circuits

The metering circuits can be divided into 3 basic circuits for Omni operation. For Localizer operation there are two basic circuits which will be covered in the next section.

Omni Deviation Indicator Meter Circuit: The secondary of the variable phase output transformer T104 and the secondary of the reference phase output transformer T101 are so phased as to control the Deviation Rectifier Amplifiers. When the reference phase and variable phases are

4-3-5. (cont'd.)

90° apart this indicates an on-course condition and the amplifiers Q501, Q502, Q503 and Q504 are driven the same amount, allowing the collector voltages of Q502 and Q503 to be equal. When the signal across T104 and T101 are other than 90° out of phase, Q501 and Q502 are driven at a different rate than Q503 and Q504. This makes the collector voltages of Q502 and Q503 unequal. When you are right of course (left deflection) the collector voltage of Q502 is positive with respect to the collector voltage of Q503. When left of course (right deflection) the collector of Q503 is positive with respects to collector voltage of Q502. The collector of Q502 is connected through series resistor R602, R603 or R604 (according to number of external 1000 ohm loads) to Pin 22 of P102. R602 is used with one external load, R603 with two external loads and R604 with 3 external loads. The collector of Q503 is connected to Pin 23 of P102. C502 is used to control the damping of the deviation indicator.

To-From Meter Circuit: The secondary of T102, reference phase output transformer, is connected directly to the base of Q506 and Q507. The signal from the secondary of T103, variable phase output transformer, is fed through a 90° phase splitter C501 and R510 to the center tap of the secondary of T102. These transformers are phased to drive Q507 at a higher level than Q506 when the incoming variable phase signal is from 0° to 180° out of phase with the reference phase signal. When the incoming signals are 180° to 360° out of phase, Q506 is driven at a higher level. When Q506 is driven at a higher level its emitter voltage is negative with respect to the emitter of Q507. Also, when Q507 is driven at a higher level its emitter voltage is negative with respect to the emitter of Q506. The emitters of Q506 and Q507 are connected to Pins 30 and 31 of P102 respectively. When Pin 30 is positive with respect to Pin 31 a To indication is obtained. When Pin 31 is positive with respect to Pin 30 a From indication is obtained. C506 and C507 are used to control the damping of the To-From indicator.

Localizer Flag Meter Circuit: The output of the Reference and Variable Phase Amplifiers is coupled by means of C503 and C504 to a rectifier circuit consisting of CR503, CR504, R513 and R514. CR503 and CR504 rectifies the 30 cps, thereby placing a direct current through R601 and the flag meter. When there is an absence of either of the 30 cps signals there is not enough current developed to energize the flag movement. When there is only one external flag load R601 is left in the circuit. With the addition of another load, R601 must be removed by means of the shorting bar. C505 is used to control the damping of the VOR Flag meter.

4-3-5 (cont'd.)

This circuit is also used for the localizer flag presentation when the Reference and Variable Phase Amplifiers are used as 90 cps and 150 cps amplifiers.

4-3-6. Localizer Operation

When a localizer frequency is selected by the DR-560 Receiver an A / voltage is supplied to Pin 25 of P102. This voltage energizes relays K101 and K102. These relays change several circuits of the converter to localizer functions.

The 90 cps and 150 cps signal is fed into the converter through Pin 32 of P102. This audio is fed to the Input Amplifier Q201 through the Input Level Control R101. The output of this amplifier is placed across Localizer Level Control R104. From the level control we go to the Localizer Balance Control R105. Each end of R105 is connected to a 90 cps and 150 cps rejection filter. These filters are placed to keep 150 cps from entering the 90 cps circuit and 90 cps from entering the 150 cps circuit.

The 150 cps is fed through K102C and coupling capacitor C404 to a four stage Direct Coupled Amplifier Q401, Q402, Q403 and Q404. Q404 is a phase splitter coupled through C409 and C410 to the Push-Pull Output Amplifier Q405 and Q406 which drives output transformers T101 and T102.

The 90 cps is fed through K102A and coupling capacitor C204 to a four stage Direct Coupled Amplifier Q202, Q203, Q204 and Q205. The Phase Splitter's (Q205) output is coupled through C209 and C210 to the Push-Pull Output Amplifier Q206 and Q207. This output drives transformers T103 and T104.

The localizer flag circuit operaties in the same manner as it did in omni operation. As in omni operation there is insufficient current to operate the flag meter if either the 90 cps or 150 cps is missing.

The Localizer Deviation Indicator circuit is primarily two rectifier circuits with a metering circuit for comparison. The secondary of T104 feeds the rectifier circuit consisting of CR502 and R508. A positive potential is placed on Pin 23 of P102 through K101A. The secondary of T102 feeds the rectifier circuit consisting of CR501 and R507. A positive

4-3-6 (cont'd.)

potential is placed on Pin 22 of P102 through K101B and the series resistances R602, R603 and R604. If the 150 cps amplitude is larger than the 90 cps amplitude, Pin 22 will be positive with respect to Pin 23 which will cause left deflection of the indicator. If the 90 cps amplitude is larger than the 150 cps amplitude, Pin 23 will be positive with respect to Pin 22 which will cause right deflection of the indicator.

4-4. DNI-2 Navigation Indicator

The DNI-2 Navigation indicator consists of five meter movements and one resolver. Figure 7-11, page 7-11 is a Schematic Diagram of the DNI-2. The Localizer and Omni Deviation Indicator meter is connected to Pins F and H on the rear connector. When F is positive with respect to H the pointer will deflect to the right. When H is positive with respect to F the pointer will deflect to the left. This meter is designed to deflect to the outer edges of the blue and yellow sectors with 90 microamperes in the meter movement. With 150 microamperes in the meter movement the pointer will deflect to the outer dots on the horizontal center line. The meter has a series and shunt resistor to allow the correct current deflection at 1000 ohm impedance.

The Glide Slope Deviation Indicator meter is connected to Pins S and T. When S is positive with respect to T the pointer will deflect up. When T is positive with respect to S the pointer will deflect downward. This meter will deflect to the third dot on the vertical center line with 90 microamperes in the meter movement. It will deflect to the outer (fifth) dot with 150 microamperes in the meter movement. This meter has a series and shunt resistor to allow the correct current deflection at 1000 ohm impedance.

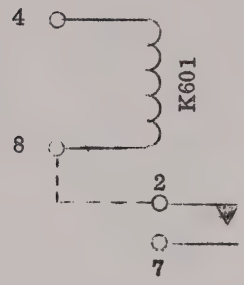
The VOR-LOC flag meter and the Glide Slope flag meter are electrically the same. Both meters have series and shunt resistors to allow the correct current deflection at 1000 ohms impedance. The VOR-LOC flag movement is connected to Pins R and X with R being the positive connection for correct deflection. The Glide Slope flag movement is connected to Pins U and L with U being the positive connection for correct deflection. Both meter pointers will leave the stops with 125 microamperes and will be completely away with 250 microamperes in the meter movements.

The To-From meter is connected to Pins K and J. This meter is designed to have 333 ohms of internal resistance and 23 degrees of deflection with 120 microamperes in the meter movement. When Pin K is positive with respect to Pin J the pointer indicates To. When Pin J is positive with respect to Pin K the pointer indicates From.

4-4. (cont'd.)

The course selection is accomplished by means of a resolver in the indicator. An input signal is placed across the rotor which is connected to Pins A and B. The phase of the signal off of the stator windings is determined by the position of the rotor in relation to the stator. The stator windings are connected to Pins C, D and E. The main purpose of the resolver is to change the phase of a signal and to monitor this phase change.

TABLE 4-1
VOR-ILS Relay Description



PURPOSE:

Provides power to Omni-Localizer Relay during 108-111 odd tenths.

Energized during LOC Freq.

PIN NO. :

(4) Goes to Pin 12 (HFIF Module) then from Pin 12 (HFIF Module) to Pin 12 of RF Module.

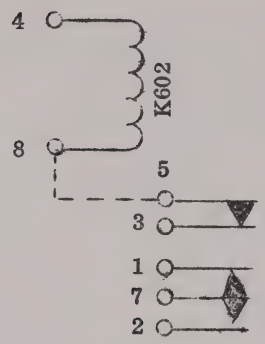
Pin 12 and 13 (HFIF) are common during odd tenths selections.
Pin 14 (RF) receives a ground during 108, 109, 110 and 111 Mc selection.
This allows Pin 4 of K601 to be grounded on all odd tenths of 108-111 Mc.

(8&2) Goes to A ⚡

(7) Goes to Pin 27 of P606, supplies A ⚡ to Omni Converter during LOC frequency range.

Relay Number	Voltage
SM2423C6	27.5 V
SM2391C6	13.75 V

TABLE 4-2
Antenna Transfer Relay Description



PURPOSE:

Energizes antenna relay during communication.
Cuts off Omni supply during communication.
Changes AGC time constant.
Changes Noise Limiter, limiting point.
Energized during navigation frequencies.

PIN NO. :

(4) Connected to Pin 13 (RF) and is supplied a ground from 108 to 118 Mc selection

(8&5) Connected to A ⏥

(3) Gives A ⏥ to Pin 19 of P606 during communication frequencies.

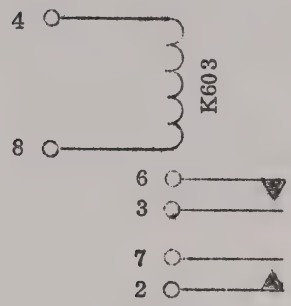
(1) Connected to Pin 7 of Audio module, gives ground during communication frequency. Noise limiter change over.

(7) Grounded.

(2) Connected to Pin 8 (LFIF Module), gives ground during navigation frequencies. AGC time constant change over.

Relay Number	Voltage
SM2423D1	27.5 V
SM2391D1	13.75 V

TABLE 4-3
Receiver Disable Relay Description



PURPOSE:

To de-energize the receiver when transmitter is operated.

PIN NO. :

(4) Connected to Pin 27 of P606. This is supplied A ⏥ when transmitter is operated.

(8&6) Connected to ground.

(3) Connected to Pin 9 (LFIF), grounds audio output of detector when relay energizes.

(7&2) Connected across audio output terminals Pin 4 and 5 (Audio module). Shorted when transmitter is operated

Relay Number	Voltage
SM2423B1	27.5 V
SM2391B1	13.75 V

SECTION V

MAINTENANCE

5-1. General Information

This section is divided into three parts consisting of the Receiver, Converter and Indicator maintenance. All repairs or tube replacements should be made with the primary power disconnected. Only resin-core solder should be used in making repairs. The use of acid flux or acid core solder can cause destructive corrosion and severe electrical losses. Special care should be taken to avoid excessive heat or mechanical strain on the numerous printed circuit boards used in this system. Avoid excessive heat when replacing transistors and diodes and the use of needle nose pliers as a "heat sink" is recommended when soldering.

5-2. DR-560 Receiver Maintenance

5-2-1. Test Equipment Required

A list of test equipment required for testing and adjusting the DR-560 Receiver is given below:

1. Test control box.
2. Source of 13.75 volts or 27.5 volts DC depending on equipment to be tested.
3. VTVM, Hewlett Packard Model 410B or equivalent.
4. Signal Generator, Boonton 211A or equivalent.
5. Modulator, Boonton 479S3 or equivalent.
6. Oscilloscope, Dumont Model 241 or equivalent.
7. Sweep Generator, Jackson Model TVG-2 or equivalent.
8. Multimeter, Triplett Model 630A or equivalent.
9. Audio Output Meter with 600 ohm impedance, DARE Model OM-1 or equivalent.
10. Relative Field Strength Meter, DARE RF-1 or equivalent.
11. Tube checker, Hickok Model 539A or equivalent.
12. Signal Generator, Hewlett Packard Model 608D or equivalent.

5-2-2. Corrective Maintenance

Trouble in the DR-560 Receiver is indicated by low sensitivity or an absence of receiver audio. Before removing the receiver from the aircraft for trouble shooting, plug a headset into the receiver's front panel phone jack and push the squelch button. If a noise level is present, the trouble could be in the aircraft's interconnections. If a noise level

5-2-2. (cont'd.)

is not present, the trouble could be in the receiver.

Some form of test control box is necessary for bench testing the DR-560 Receiver. This control box should facilitate the requirements necessary in an aircraft installation. These requirements are: Frequency Selection Control Unit, Audio Output, VOR-LOC Output, Remote Squelch, ON-OFF Switch and Volume Control, and facilities for patching the DNC-4 Converter and DNI-2 Indicator into the system. The Cabling Diagram Figure 7-1, page 7-1 shows the necessary wiring and controls for operation of the system.

Connect a VHF Signal Generator to the antenna jack on the front panel of the DR-560. Check the receiver sensitivity and signal to noise ratio at several frequencies throughout the frequency range. If indications are abnormal, refer to the Receiver Trouble Shooting Diagram Figure 5-1, page 5-4. After trouble has been localized to a specific circuit, check the tubes and then a voltage and resistance measurement should be taken (refer to Tables 5-1 and 5-2, page 5-19 and 5-20). If trouble arises in the filament circuits refer to the Simplified Filament Circuit Diagram Figure 5-2, page 5-5.

Audio Section Trouble Shooting Procedure

Place a .5 Volt (1000 cycles) audio signal into Pin 9 of P401. This should produce 50 milliwatts of audio output when the squelch circuit is de-energized. If the output is abnormal, each section of the audio module should be checked separately. R415 is placed in the circuit during communications frequencies to change the limiting action at a higher level of rf modulation. Therefore this check should be made with the receiver tuned to a frequency within the range of 118-135.95 Mc. Place .2 Volt (1000 cycles) audio across the primary of T402. If 50 milliwatts of audio is not produced the bias on Q401 is not correct or Q401 needs to be replaced. If 50 milliwatts of audio is present, place .22 Volt (1000 cycle) audio across R406 with the potentiometer fully clockwise. If the output is lower than 50 milliwatts check V401 and its voltage and resistances. If audio output is normal, place .22 Volt audio at the junction of C405 and R413. If audio output is below 50 milliwatts the squelch diode CR401 is either faulty or has reverse bias placed upon it. If reverse bias is present check V401 and its voltage and resistances. If output is normal check the noise limiter diode CR402 and its bias.

5-2-2. (cont'd.)

Ledex System Trouble Shooting

This control system is designed so that whenever the control switch (C/560GS) and the seeking switches are not set to the same electrical position, the ledex unit will operate and drive its shaft to the proper position so that electrical symmetry is restored. When the ledexs are not operating correctly there can be several malfunctions. The first step for correction should be to check out the installation for faulty connection (refer to Control Unit C/560GS Schematic Diagram Figure 7-2, page 7-2). The following trouble shooting guide is provided to aid in localizing troubles.

a. Trouble - Ledex motor does not de-energize.
   Possible Causes
   1. Commutating switch contacts bent or stock together.
   2. Tuning rack, coupling, detent or ratchet drive mechanisms jammed.
   3. Short to ground on negative side of ledex.

b. Trouble - Ledex Motor Continues to Rachet
   Possible Causes
   1. Intermittent or continuous short to ground on seeking frequency selector wafer or commutating switch.
   2. Detent spring weak or broken, allowing ledex to overshoot.

c. Trouble - Ledex set upon wrong channel part of time.
   Possible Causes
   1. Broken wire or poor connection on one or more control wires.
   2. Open circuit between ground and front side of remote switch.

d. Trouble - Ledex sets up on some channels, runs continuously on others
   Possible Causes
   1. Control wires shorted to ground.
   2. Control wires shorted to each other.

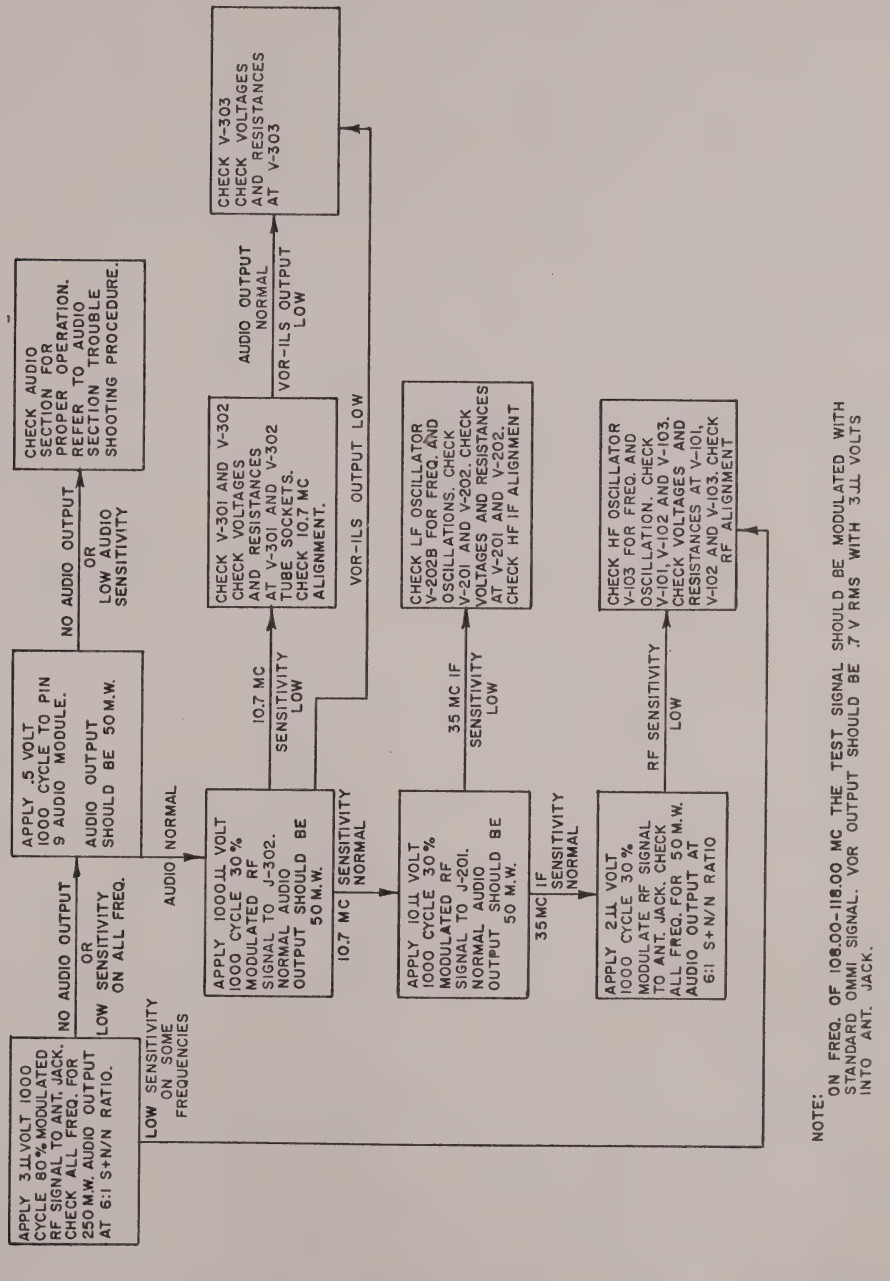

APPLY 3 μV VOLT 1000 CYCLE 80% MODULATED RF SIGNAL TO ANT. JACK. CHECK ALL FREQ. FOR 250 M.W. AUDIO OUTPUT AT 6:1 S+N/N RATIO.
NO AUDIO OUTPUT
OR
LOW SENSITIVITY ON ALL FREQ.
LOW SENSITIVITY ON SOME FREQUENCIES
AUDIO NORMAL
APPLY .5 VOLT 1000 CYCLE TO PIN 9 AUDIO MODULE.
AUDIO OUTPUT SHOULD BE 50 M.W.
NO AUDIO OUTPUT
OR
LOW AUDIO SENSITIVITY
CHECK AUDIO SECTION FOR PROPER OPERATION. REFER TO AUDIO SECTION TROUBLE SHOOTING PROCEDURE.
APPLY 1000 μV VOLT 1000 CYCLE 30% MODULATED RF SIGNAL TO J-302. NORMAL AUDIO OUTPUT SHOULD BE 50 M.W.
10.7 MC
SENSITIVITY LOW
CHECK V-301 AND V-302 CHECK VOLTAGES AND RESISTANCES AT V-301 AND V-302 TUBE SOCKETS. CHECK 10.7 MC ALIGNMENT.
AUDIO OUTPUT NORMAL
VOR-ILS OUTPUT LOW
CHECK V-303 CHECK VOLTAGES AND RESISTANCES AT V-303
10.7 MC
SENSITIVITY NORMAL
VOR-ILS OUTPUT LOW
APPLY 10 μV VOLT 1000 CYCLE 30% MODULATED RF SIGNAL TO J-201. NORMAL AUDIO OUTPUT SHOULD BE 50 M.W.
35 MC IF
SENSITIVITY LOW
CHECK LF OSCILLATOR V-202B FOR FREQ. AND OSCILLATIONS. CHECK V-201 AND V-202. CHECK VOLTAGES AND RESISTANCES AT V-201 AND V-202. CHECK HF IF ALIGNMENT
35 MC IF
SENSITIVITY NORMAL
APPLY 2 μV VOLT 1000 CYCLE 30% MODULATE RF SIGNAL TO ANT. JACK. CHECK ALL FREQ. FOR 50 M.W. AUDIO OUTPUT AT 6:1 S+N/N RATIO
RF SENSITIVITY LOW
CHECK HF OSCILLATOR V-103 FOR FREQ. AND OSCILLATION. CHECK V-101, V-102 AND V-103. CHECK VOLTAGES AND RESISTANCES AT V-101, V-102 AND V-103. CHECK RF ALIGNMENT
NOTE:
ON FREQ. OF 108.00-118.00 MC THE TEST SIGNAL SHOULD BE MODULATED WITH STANDARD OMNI SIGNAL. VOR OUTPUT SHOULD BE .7 V RMS WITH 3 μV VOLTS INTO ANT. JACK.

Figure 5-1 DARE DR-560, Trouble Shooting Diagram

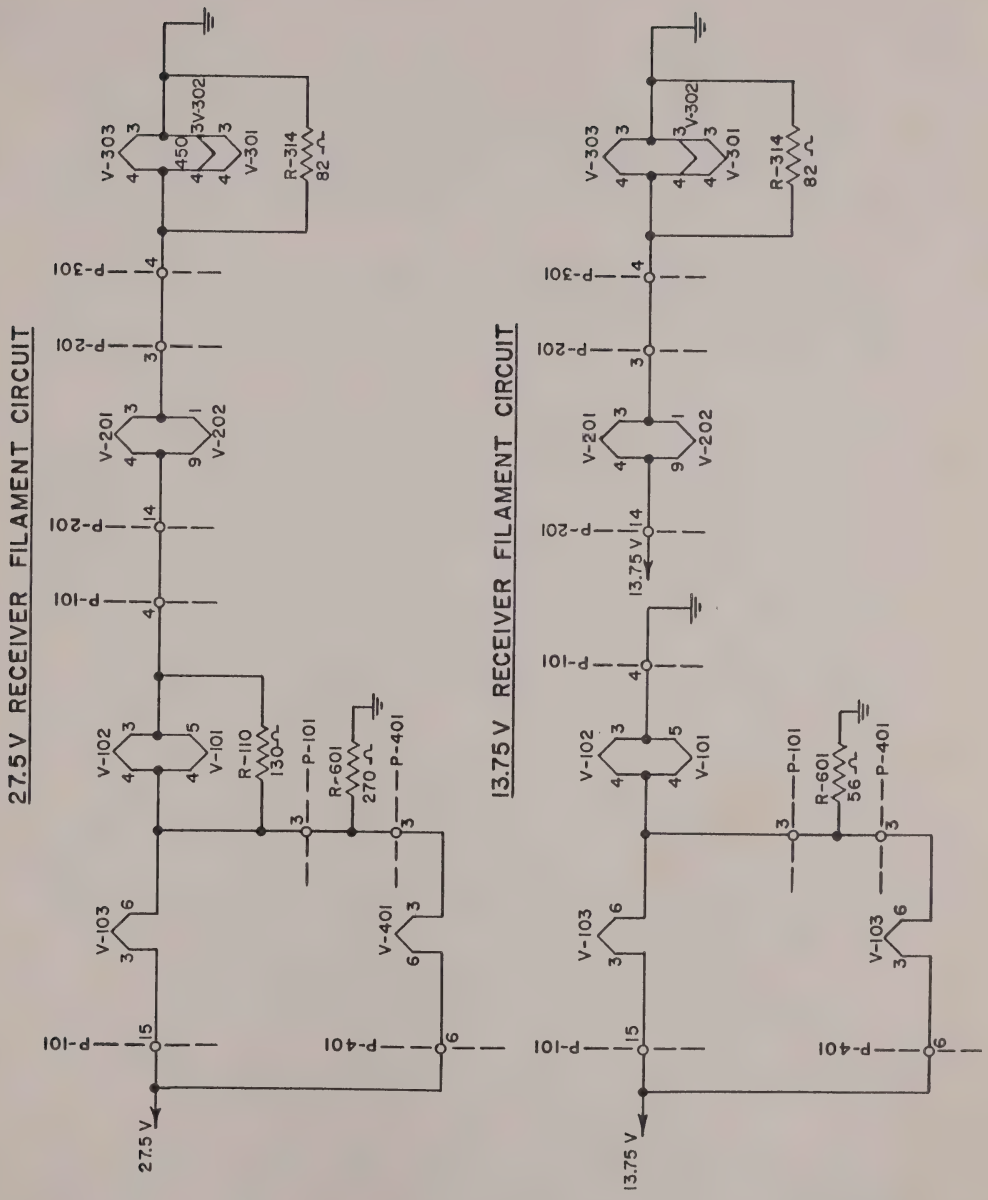


Figure 5-2 DARE DR-560, Simplified Filament Circuit

5-2-3. (cont'd.)

Alignment of DR-560 Receiver.

With the Mc knob on the control unit, check to see that the RF Module ledex operates on each position. With the control unit set to 108 Mc, set the front panel indicator dial so that 108 is visible through the dial window.

With the 50 Kc knob on the control unit check to see that the HFIF Module ledex operates on each position. With the control unit set to .00 Kc, set the front panel indicator dial so that 00 is visible through the dial window.

With the control unit in the 108.5 Mc position and with a Boonton Type 211-A signal generator, place a 108.5 Mc signal into the front panel antenna connector J609. This signal is to be modulated 30% with 1000 cycle. With the squelch circuit de-energized and R406 turned fully clockwise there should be an audio output signal. If there is no audio output refer to the Receiver Trouble Shooting diagram. Place a large enough RF signal into the antenna jack to develope an AGC voltage. Tune T304, T303, T302, T301, T201, L204, L203, L202, L201, T101, L109, L105, L104, and L101 for peak AGC voltages. At this point 2 microvolts of RF modulated at 30% (1000 cycles) should produce 50 M.W. of audio.

Tracking of the RF Module is the next consideration. At all times when tracking this module, the HFIF Module should be peaked on .50 Mc position. Change the control unit to 135.5 Mc and the signal generator to the same. Retune L109, L105, L104, L101, C103, C109 and C112 so that the unit will track. Tracking between the high and the low end of the frequency range will best be accomplished by the following manner.

NEED - MORE CAP. HI END, LESS AT LOW END.
TO TRACK - DECREASE CAPACITY, INCREASE INDUCTANCE.

NEED - LESS CAP. HI END, MORE AT LOW END.
TO TRACK - INCREASE CAPACITY, DECREASE INDUCTANCE.

Tracking of the HFIF Module is the next consideration. Place the control unit to 108.0 Mc and the signal generator to the same. Tune L203, L202, L201, C214, C209 and C205 for the maximum AGC voltage. Place the control unit and the signal generator to 108.95 Mc. Retune the tank circuits to achieve tracking by following the preceeding rules.

5-2-3. (cont'd.)

Tracking of the Lf Oscillator V202B is accomplished by means of L204. Place a 135.95 Mc signal into the front panel antenna connector and adjust L204 for maximum AGC voltage. When a maximum is reached back off the adjustment approximately one-quarter of a turn. Go to the low end, 108.00 Mc and check for oscillation. L204 may have to be readjusted slightly for good tracking.

Tuning the filter input and output transformers (T301 and T302) is the next step in alignment. With control unit and signal generator set at any frequency within the receiver's range, tune T301 and T302 for maximum AGC voltage. With a signal variation of $\pm$ 20 Kc from center frequency at a 3 microvolt signal level, the AGC voltage should not vary more than 3 db. If it does, it will be necessary to set up the Sweep Generator to obtain a response curve. This is best accomplished by placing the sweep signal and the marker signal into J302 on the LFIF Module. The center frequency of the LFIF section is 10.7 Mc therefore a signal of 10.7 Mc must be used as a marker. The output of the audio detector circuit (junction of R306 and C314) should be placed on the vertical axis input of an oscilloscope. The horizontal output of the sweep generator should be placed on the horizontal axis input of an oscilloscope. Tune T301 and T302 for a response curve which has sharp leading and trailing edges and a relatively flat top. The output of the sweep generator should be low so as not to overdrive the filter. After final tuning of the LFIF Module, the following results should be obtained.

AGC voltage should be developed at 2 microvolts or less on all frequencies.

With an RF signal of 3 microvolts, modulated 80% 1000 cycles, between 118.0-135.95 Mc there should be approximately 1.2 volts RMS at omni output. There should also be 250 milliwatts of audio at output jacks (R406 and R308 fully clockwise).

With an RF signal of 3 microvolts, modulated with Standard Omni Signal, between 108.0 - 117.95 Mc, there should be approximately 0.7 volt RMS at omni output (R308 fully clockwise). This signal should be free of distortion and comparable to the demodulated signal out of the Signal Generator. This signal is approximately $\pm$ 7 degrees out of phase with the demodulated signal of the signal generator.

5-2-3. (cont'd.)

The squelch potentiometer should be set to open the squelch circuit on all frequencies at a 2 microvolts input level.

5-3. DNC-4 Navigation Converter Maintenance

5-3-1. Test Equipment Required

1. Test control box.
2. Source of 13.75 volts or 27.5 volts DC depending on equipment to be tested.
3. VTVM, Hewlett-Packard Model 410B or equivalent.
4. Modulator, Boonton 479S-3 or equivalent.
5. Oscilloscope, Dumont Model 241 or equivalent.

5-3-2. Corrective Maintenance

Trouble shooting of the DNC-4 Navigation Converter can be accomplished by utilizing the 479S-3 Modulator and some form of test control box. The test control box should consist of a course selector; a 1000 ohm 150-0-150 microammeter for Left-Right indications; a 1000 ohm 250 microammeter for a Flag indication; a 333 ohm 500-0-500 microammeter for To-From indications; and a toggle switch for switching VOR-LOC operations. The Cabling Diagram Figure 7-1, page 7-1 shows the necessary wiring for operation of this system.

Before any test signal is applied, the Input Level Control R101 and the Localizer Level Control R104 should be turned fully clockwise. Apply 0.4 VAC of standard omni signal, with the 479S-3 bearing selector set at 0^{o}, to the converter at Pin 32 of P102. Set the OBS to 352.5^{o} and the following results should be obtained: On-course indication, 250 microamperes of flag current and 200 microamperes of current to produce a From indication. A 20^{o} course width should be obtained with 0.4 VAC of omni signal.

On the test control box, switch the converter to LOC position. Apply 0.32 VAC of standard localizer signal at 0 db ratio to Pin 32 of P102. The following results should be obtained: On-course indication and 250 microamperes of flag current. Change the modulator to a 4 db ratio and there should be 90 microamperes of indicator current. With the loss of either signal the flag current should drop below 250 microamperes.

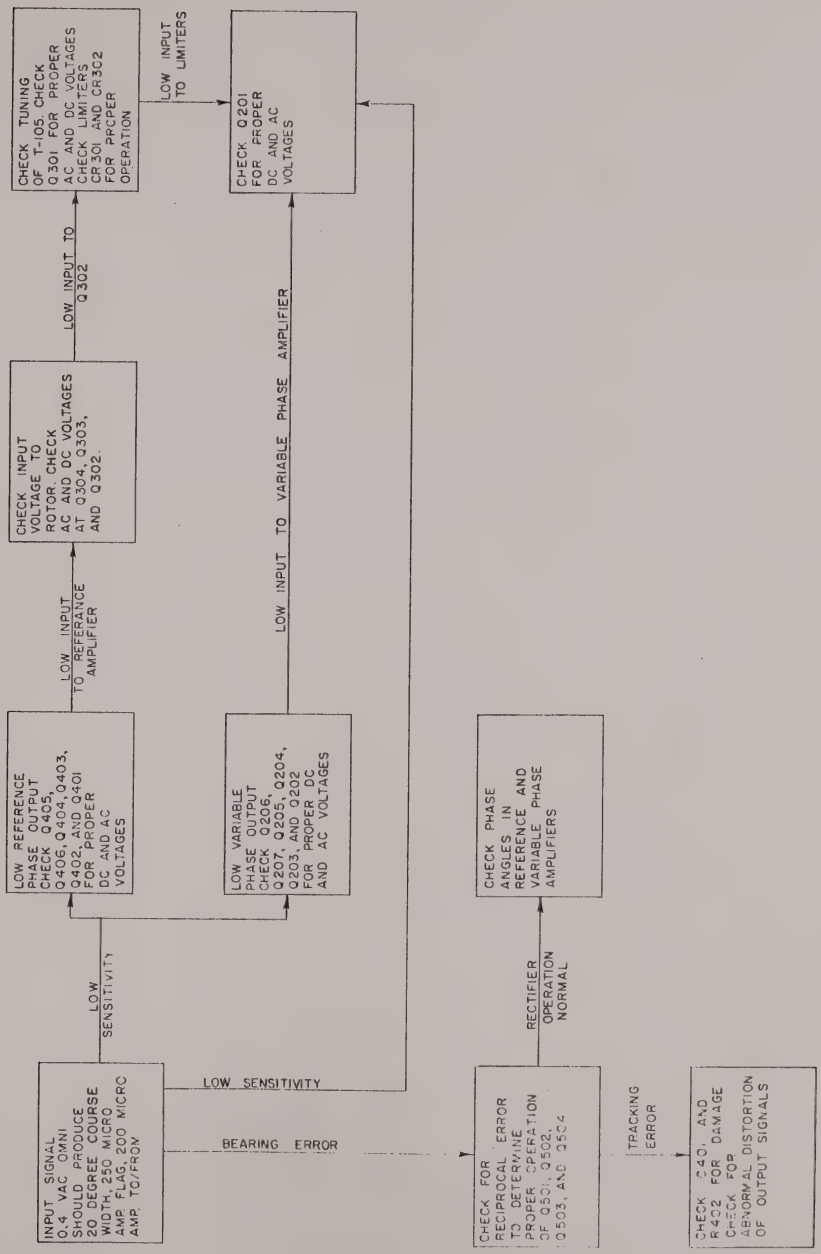

INPUT SIGNAL 0.4 VAC OMNI SHOULD PRODUCE 20 DEGREE COURSE WIDTH 250 MICRO AMP FLAG, 200 MICRO AMP TO/FROM
LOW SENSITIVITY
LOW REFERENCE PHASE OUTPUT CHECK Q405, Q406, Q404, Q403, Q402, AND Q401 FOR PROPER DC AND AC VOLTAGES
LOW INPUT TO REFERANCE AMPLIFIER
CHECK INPUT VOLTAGE TO ROTOR. CHECK AC AND DC VOLTAGES AT Q304, Q303, AND Q302.
LOW INPUT TO Q302
CHECK TUNING OF T-105. CHECK Q301 FOR PROPER AC AND DC VOLTAGES CHECK LIMITERS CR301 AND CR302 FOR PROPER OPERATION
LOW INPUT TO LIMITERS
LOW SENSITIVITY
LOW VARIABLE PHASE OUTPUT CHECK Q206, Q207, Q205, Q204, Q203, AND Q202 FOR PROPER DC AND AC VOLTAGES
LOW INPUT TO VARIABLE PHASE AMPLIFIER
CHECK Q201 FOR PROPER DC AND AC VOLTAGES
BEARING ERROR
CHECK FOR RECIPROCAL ERROR TO DETERMINE PROPER OPERATION OF Q501, Q502, Q503, AND Q504
RECTIFIER OPERATION NORMAL
CHECK PHASE ANGLES IN REFERENCE AND VARIABLE PHASE AMPLIFIERS
TRACKING ERROR
CHECK Q401 AND R402 FOR DAMAGE CHECK FOR ABNORMAL DISTORTION OF OUTPUT SIGNALS

Figure 5-3A DARE DNC-4, Omni Trouble Shooting Diagram

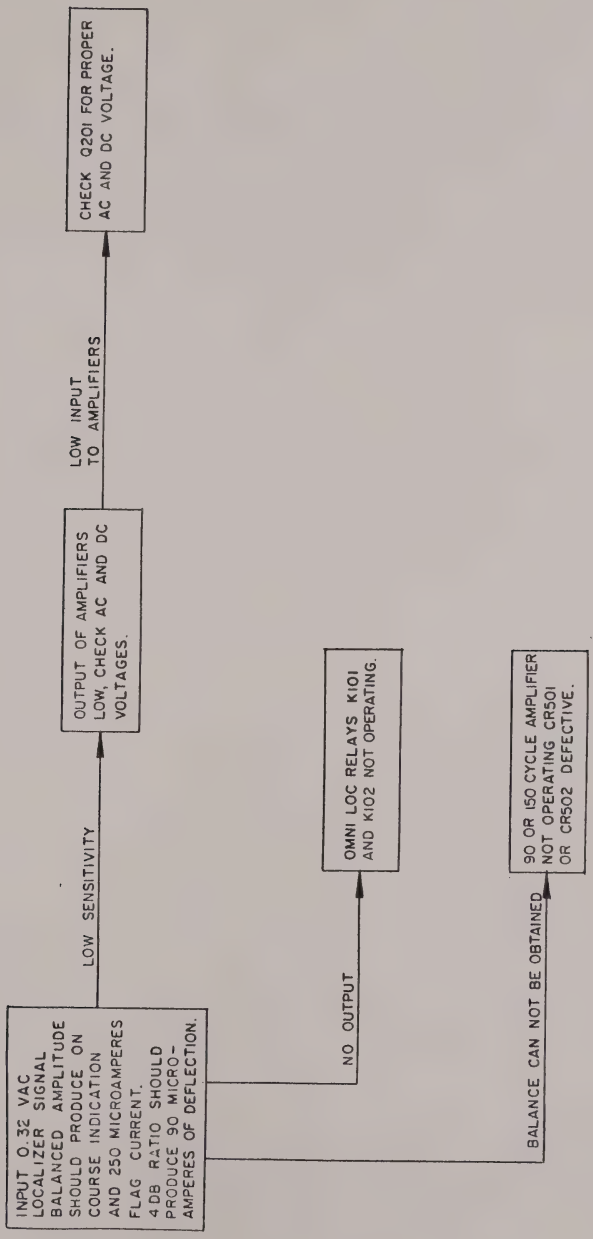

INPUT 0.32 VAC LOCALIZER SIGNAL BALANCED AMPLITUDE SHOULD PRODUCE ON COURSE INDICATION AND 250 MICROAMPERES FLAG CURRENT. 4 DB RATIO SHOULD PRODUCE 90 MICRO-AMPERES OF DEFLECTION.
LOW SENSITIVITY
OUTPUT OF AMPLIFIERS LOW, CHECK AC AND DC VOLTAGES.
LOW INPUT TO AMPLIFIERS
CHECK Q201 FOR PROPER AC AND DC VOLTAGE.
NO OUTPUT
OMNI LOC RELAYS K101 AND K102 NOT OPERATING.
BALANCE CAN NOT BE OBTAINED
90 OR 150 CYCLE AMPLIFIER NOT OPERATING CR501 OR CR502 DEFECTIVE.

Figure 5-3B DARE DNC-4, Localizer Trouble Shooting Diagram

5-3-2. (cont'd.)

If the converter does not meet the preceeding specifications the alignment procedure and the Converter Trouble Shooting Charts, Figure 5-3A and 5-3B, page 5-10 and 5-11 should be consulted.

When A ⚡ is applied to the converter a check of DC voltages at certain points will determine the status of transistor and diode action. The most critical voltages are at CR101, C205, C213, C315, C403, C405, C413, emitter of Q304, Q404 and Q205 and Pins 1 and 4 of the four output transformers.

5-3-3. Alignment and Adjustment Procedure

Before complete alignment of the DNC-4 Navigation Converter the Input Level Control R101 and Localizer Level Control R104 should be turned fully clockwise. The Phase Adjust Control R110, the Localizer Balance Control R105 and the Deviation Indicator Balance R106 should be turned to mid scale. The external load jumpers on the front of the converter chassis should be placed in position one. When alignment is completed these jumpers should be positioned according to the number of external loads in the installation.

Apply 0.4 VAC of standard omni signal with the 479S-3 bearing selector set at 0^{o} to the converter at Pin 32 of P102. The OBS should be set to 0^{o}. The phase discriminator transformer T105 should be tuned at this time. The primary and secondary are tuned to 9960 cycles by means of C103, C304, C306 and C104. C103 and C104 are selected values between the range of .015 - .04 microfarads and are selected for a maximum undistorted signal at the junction of C307 and R308. If the signal at this point is not of the proper level C103 and C104 should be re-selected. This signal should produce approximately .75 VRMS at the input to the OBS rotor. With proper AC voltage on the rotor there should be 3 VRMS at output transformers T101 and T102. This output voltage may be adjusted by proper selection of R404. This resistor range will be between 500 - 2K ohms. R423 is selected between the range of 15K to 27K to operate the push-pull amplifier Class A. The proper value is obtained when 1.5 VDC is measured on the collectors of Q405 and Q406.

With the same applied voltage, adjustments in the variable phase amplifiers is now necessary. R223 is selected between 15K to 27K ohms to obtain 1.5 VDC on the collectors of Q206 and Q207. R102 is selected between 10K to 22K ohms to obtain 2 VRMS at the output transformers T103 and T104.

5-3-3. (cont'd.)

The Phase Adjust Control R110 should be set for an on-course indication. At this time the flag current should be 250 microamperes and the To-From current 200 microamperes. Check for proper course width of approximately 20°.

With the 479S-3 set at 0°, rotate the OBS to 180°. Note the reciprocal error and adjust the Deviation Indicator Balance Control R106 to correct for one half of error. Return the OBS to 0° and adjust the Phase Adjust Control R110 for an on-course indication. This procedure may be repeated if necessary to correct for reciprocal error.

The next step is to check the converter for tracking (quadrantal error). This is done by rotating the OBS and the 479S-3 in 30° increments and checking for on-course indication error. R402 is a selected resistor for reducing the error.

Set the OBS to 90° and the 479S-3 to 0°. Check the To-From metering circuit for 0 current deflection. R510 should be selected to compensate for phase error and to cause 0 current deflection at the above settings.

The DNC-4 Converter is now properly aligned and calibrated for omni operation. For localizer operation the following alignment procedure must be used. Energize the localizer circuits and set the 479S-3 to a 0 db ratio of tone localizer signal. Apply 0.32 VAC to Pin 32 of P102. Adjust Localizer Balance Control R105 for 0 indicator current. Change the 479S-3 to a 4 db ratio and adjust Localizer Level Control R104 for 90 microamperes of indicator current. The DNC-4 is now aligned and calibrated for localizer operation.

For usage with the DR-560 Navigation Receiver the following adjustments should be made. Set the 479S-3 bearing selector to 0°. With 0.4 VAC into the converter, set the OBS to 352.5°. Adjust the phase Adjust Control R110 for an on-course indication. This is necessary due to approximately 7.5° of phase shift in the DR-560 Navigation Receiver.

With a complete system the following results and fine adjustments should be accomplished.

1. 1000 microvolts r-f signal modulated with standard omni signal into receiver.
   a. Adjust R110 for an on-course indication.
   b. Adjust R106 for a minimum reciprocal error.

5-3-3.(cont'd.)

2. 1000 microvolts r-f signal modulated with 0 db tone localizer signal into receiver.
   a. Adjust R105 for an on-course indication.

3. 1000 microvolts r-f signal modulated with 4 db tone localizer signal into receiver.
   a. Adjust R104 for 90 microamperes (3rd dot on indicator) of left-right indication.

4. Flag should appear with the loss of either signal in both omni and localizer operation.

5. A 2-5 microvolt r-f signal modulated with standard omni signal should produce flag away.

6. A 10-20 microvolt r-f signal modulated with a 0 db tone localizer signal should produce flag away.

5-4. DNI-2 Navigation Indicator Maintenance

5-4-1. Test Equipment Required

1. VTVM, Ballantine 300 or equivalent.
2. Audio Generator, capable of delivery 4.5 to 8 volts across 2000 ohm load.
3. Oscilloscope, Dumont Model 241 or equivalent.
4. Precision Omni Bearing Selector, Collins Type 479X-2 or equivalent.
5. Current Source, 0 - 500 Microamperes.
6. Microammeter, 0 - 500 Microamperes.

5-4-2. Corrective Maintenance

Trouble shooting of the DNI-2 Navigation Instrument can best be accomplished by following the following procedure.

a. VOR-LOC Indicator

Place 90 microamperes through Pins F and H and the indicator should deflect to the third dot. Right deflection occurs when Pin F is positive with respect to Pin H.

5-4-2. (cont'd.)

Left deflection occurs when Pin H is positive with respect to Pin F. 150 microamperes should cause deflection to the outer dot. Check meter movement for 1000 ohms internal resistance.

b. Glide S lope Indicator

This meter movement is electrically the same as the VOR-LOC Indicator. This meter movement is tied to Pins S and T and for up deflection, Pin S is positive with respect to Pin T. For down deflection, Pin T is positive with respect to Pin S.

c. VOR-LOC Flag

Place 125 microamperes through Pins R and X and the flag should begin to leave the stops. With 250 microamperes the flag should disappear. For correct deflection, Pin R should be positive with respect to Pin X. Check meter movement for 1000 ohms internal resistance.

d. Glide Slope Flag

This meter movement is electrically the same as the VOR-LOC flag. This meter movement is tied to Pins L and U with Pin U being positive for correct deflection.

e. To - From Flag

Place 120 microamperes through Pins J and K and the indicator should completely fill either the To or From window. For to deflection, Pin K is positive with respect to Pin J. For from deflection, Pin J is positive with respect to Pin K. Check meter movement for 333 ohms internal resistance.

FOR REPAIR OR REPLACEMENT OF ANY METER MOVEMENTS, THE INDICATOR SHOULD BE RETURNED TO DISTRIBUTOR FOR DIRECT MANUFACTURER'S SERVICING.

5-4. (cont'd.)

5-4-3. Alignment and Adjustment Procedure

The alignment and adjustment procedure is concerned primarily with the omni resolver zeroing. For correct setting of the ORZ, set equipment up as shown in Figure 5-4, page 5-18. The audio generator must be capable of delivering 4.5 to 8 volts acrossa 2000 ohm load. The frequency of the 30 cycle source should be accurate within 1%.

On the 479X-2 set the selector switch to SET ORZ.

Adjust the INPUT LEVEL control for a level of 4.25 volts at the voltmeter jack.

On the DNI-2 set the OBS dial to 300°.

Refer to Figure 5-5, page 17 and note points 1 and 2. Loosen the set screw at point 1 and remove the screw at point 2. With the OBS dial set at 300°, adjust the resolver rotor relative to the stator until a null is obtained. This is accomplished by inserting a small screwdriver into the slotted rotor shaft through point 2.

With the OBS dial set at 300° and a null at the output, tighten the set screw at point 1 and replace the screw at point 2. This will lock the rotor in place giving a standard 83° leading phase relationship between the stator voltage and the generator voltage with electrical zero at 300°.

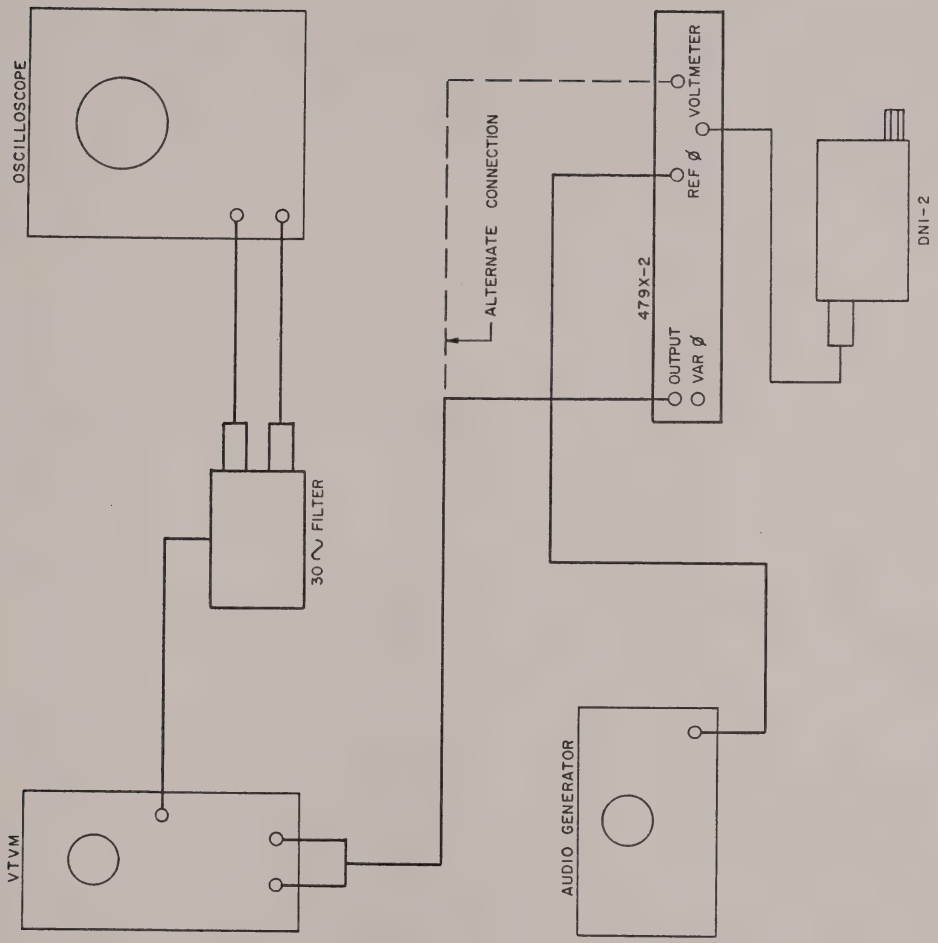
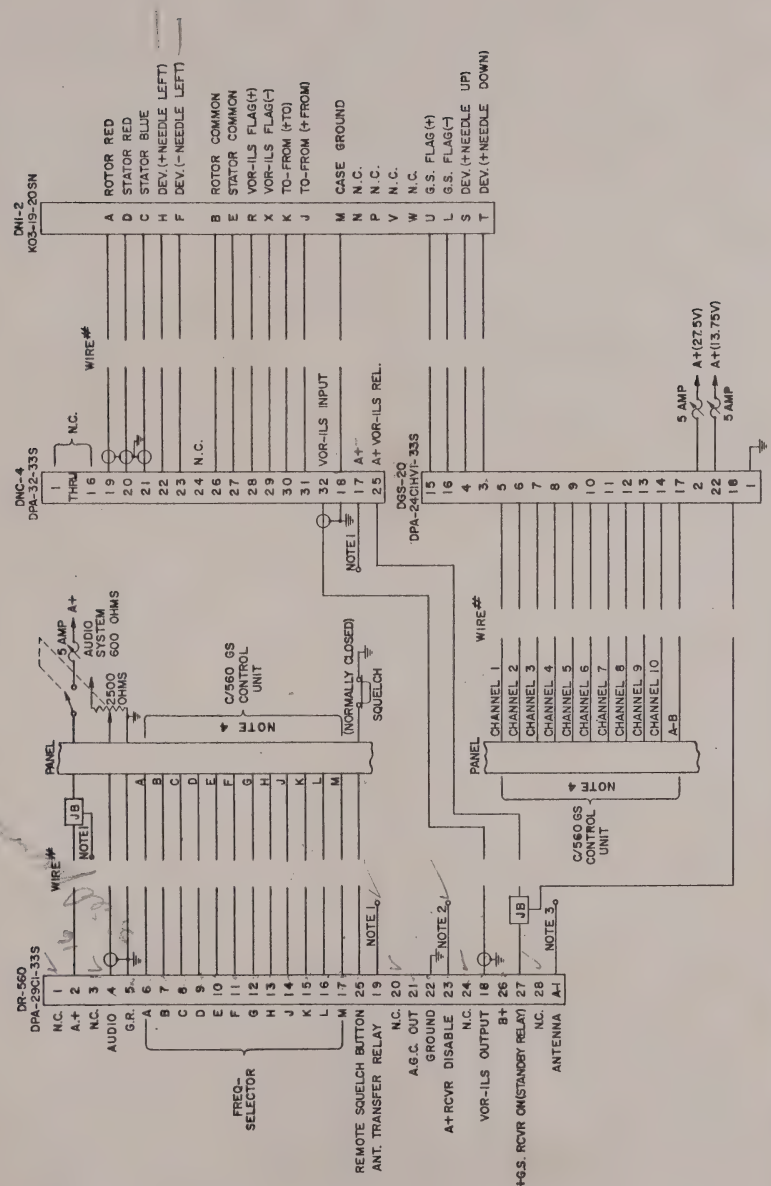


Figure 5-4 DARE DNI-2, Omni Resolver Zero Adjustment Diagram



NOTES
(1) A+ TO THE CONVERTER (DNC-4) CAN BE TAKEN FROM EITHER THE DR-560 INPUT SOURCE OR FROM A RELAY CIRCUIT OPERATED OFF OF PIN 19 (DR-560)
(2) A+ AT PIN 23 (DR-560) DE-ENERGIZES RECEIVER DURING TRANSMIT.
(3) FACILITIES ARE AVAILABLE FOR ANTENNA CONNECTIONS THRU REAR CONNECTOR.
(4) SEE C/560 GS CONTROL UNIT SCHEMATIC DIAGRAM FOR CORRECT WIRING SEQUENCE.
(5) ALL WIRES ARE #22 AWG EXCEPT PRIMARY POWER LINES #16 AWG WIRE OR LARGER IS USED DEPENDING ON LENGTH.

Figure 7-1 DARE Navigation System DN-560, Cabling Diagram

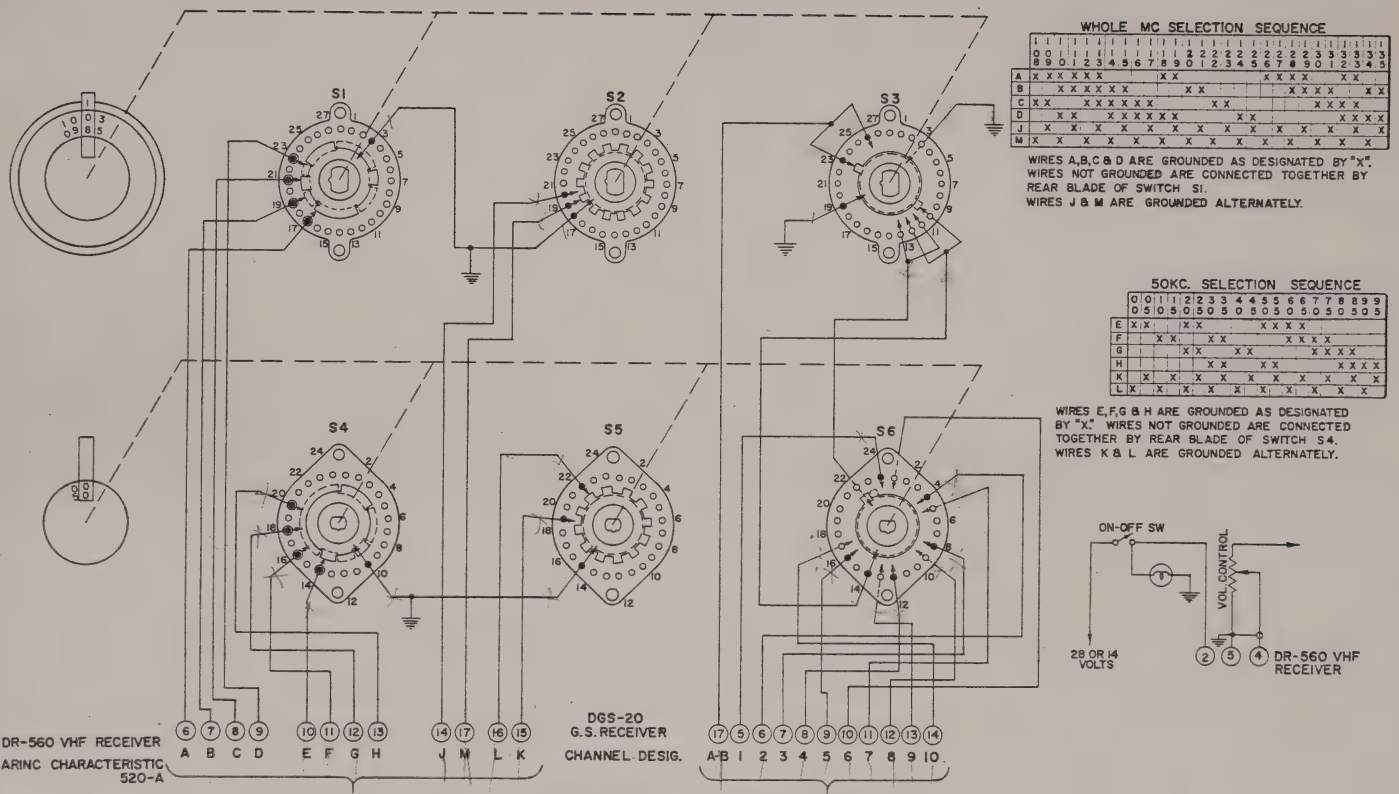

S1
S2
S3
S4
S5
S6
WHOLE MC SELECTION SEQUENCE
WIRES A,B,C & D ARE GROUNDED AS DESIGNATED BY "X".
WIRES NOT GROUNDED ARE CONNECTED TOGETHER BY REAR BLADE OF SWITCH S1.
WIRES J & M ARE GROUNDED ALTERNATELY.
50KC. SELECTION SEQUENCE
WIRES E,F,G & H ARE GROUNDED AS DESIGNATED BY "X." WIRES NOT GROUNDED ARE CONNECTED TOGETHER BY REAR BLADE OF SWITCH S4.
WIRES K & L ARE GROUNDED ALTERNATELY.
ON-OFF SW
VOL CONTROL
28 OR 14 VOLTS
DR-560 VHF RECEIVER
DR-560 VHF RECEIVER ARINC CHARACTERISTIC 520-A
A B C D E F G H J M L K
DGS-20 G.S. RECEIVER CHANNEL DESIG.
A-B 1 2 3 4 5 6 7 8 9 10
TO VHF RECEIVER DR-560
TO GLIDE SLOPE RECEIVER DGS-20

Figure 7-2 DARE Control Unit C/560GS, Schematic Diagram

NOTES:

1. KEY TO SWITCHES–
   - FRONT CONTACT
   - REAR CONTACT
   - FRONT & REAR CONTACTS ELECTRICALLY CONNECTED
2. ALL SWITCHES SHOWN IN FRONT VIEW AT 108.0 MC POSITION. FREQUENCY INCREASES WITH CLOCKWISE DIRECTION.
3. FRONT & REAR ROTOR BLADES ARE INSULATED FROM EACH OTHER.
4. FOR C/560 CONTROL UNIT OMIT SWITCHES S3 & S6

GLIDE SLOPE SELECTION SEQUENCE

CHANNEL	WIRE NO.	RECEIVER FREQUENCY 108 & 110 .1	.3	.5	.7	.9	109 & 111 .1	.3	.5	.7	.9
1	5	X									
2	6		X								
3	7			X							
4	8				X						
5	9					X					
6	10						X				
7	11							X			
8	12								X		
9	13									X	
10	14										X

WIRE #17 IS GROUNDED ON 108 & 111 MC FOR B CHANNELS. WIRES #5 THRU 14 ARE GROUNDED AS DESIGNATED BY "X".

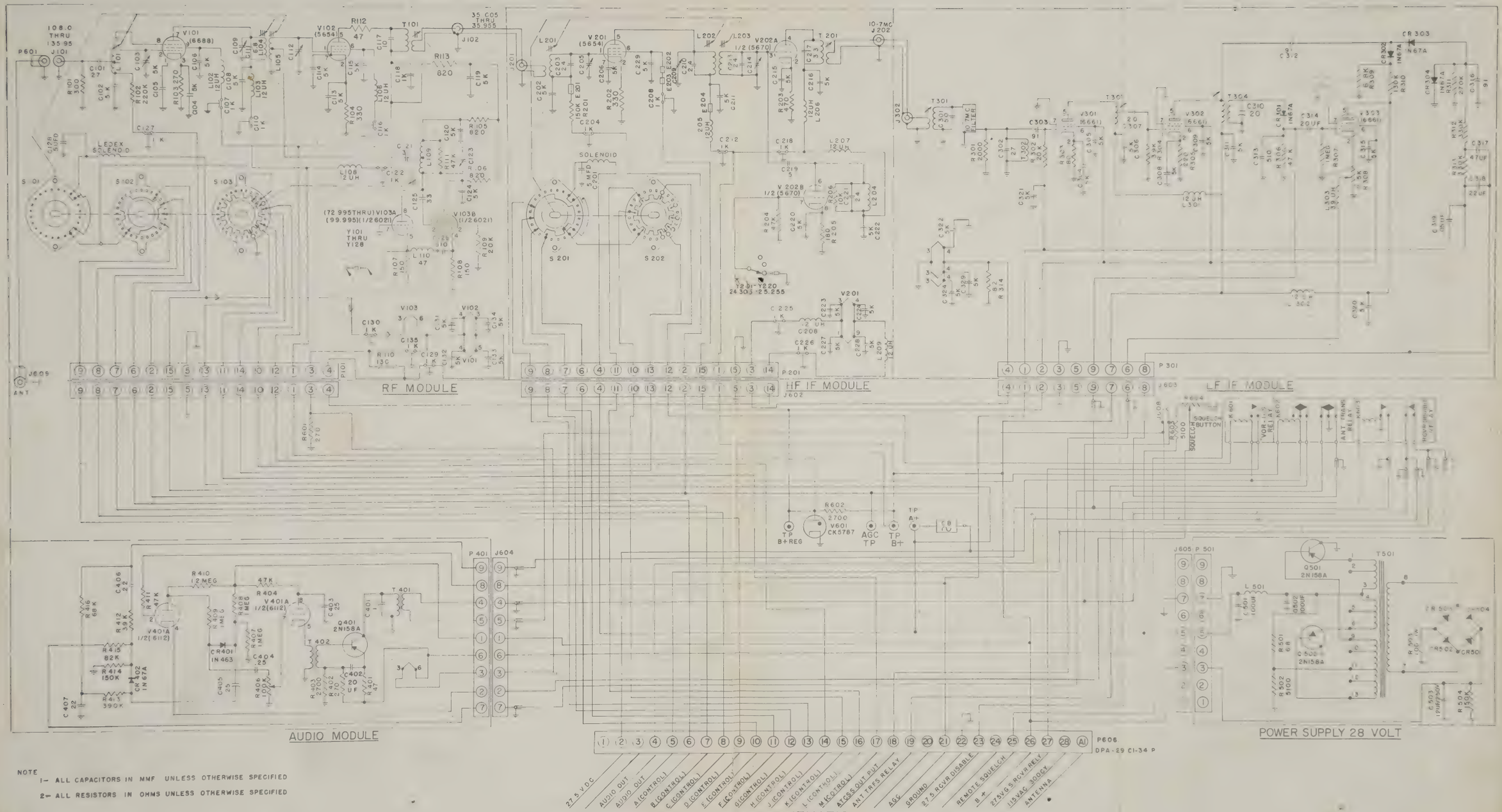


Figure 7-3 DARE Navigation Receiver DR-560, Schematic Diagram

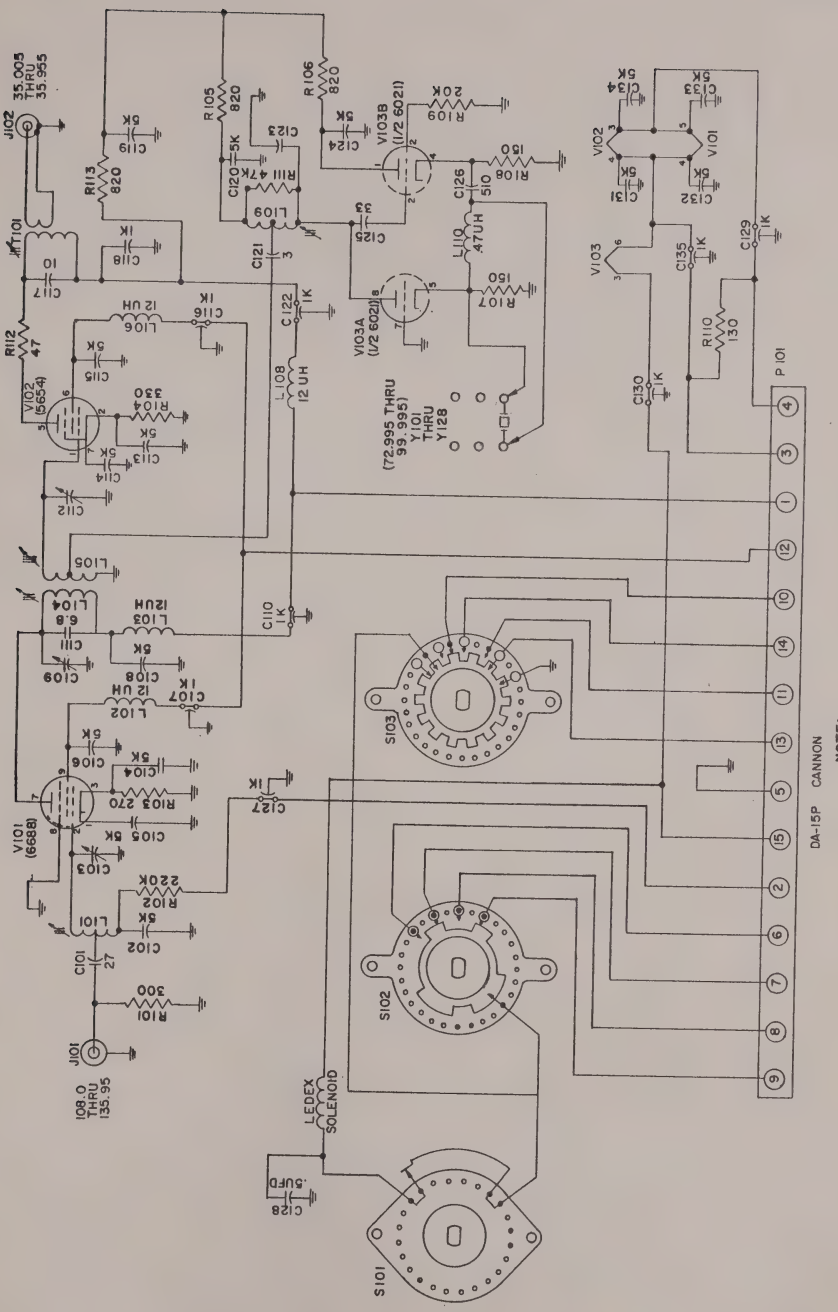


Figure 7-4 DARE DR-560, RF Module Schematic Diagram

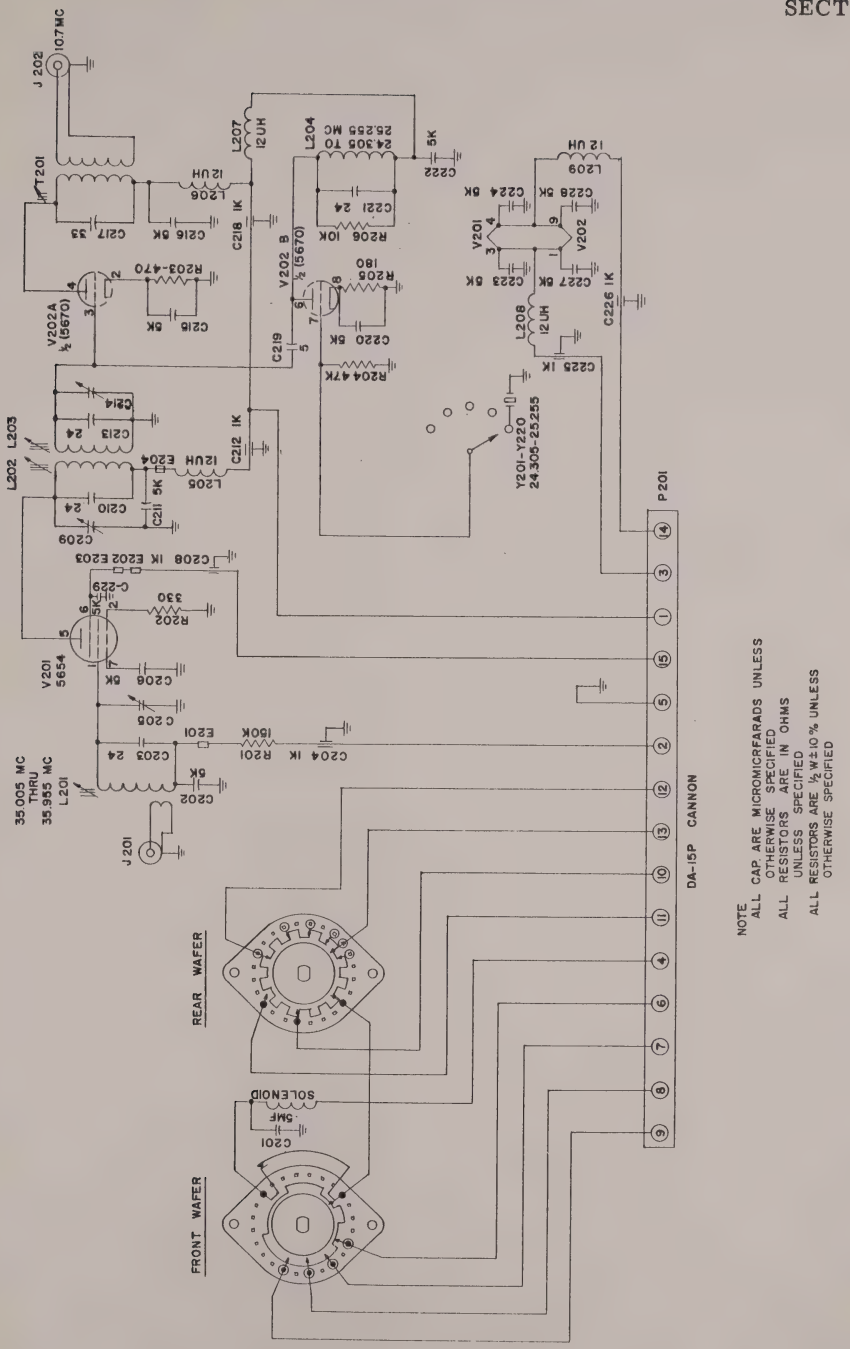


Figure 7-5 DARE DR-560, HFIF Module Schematic Diagram

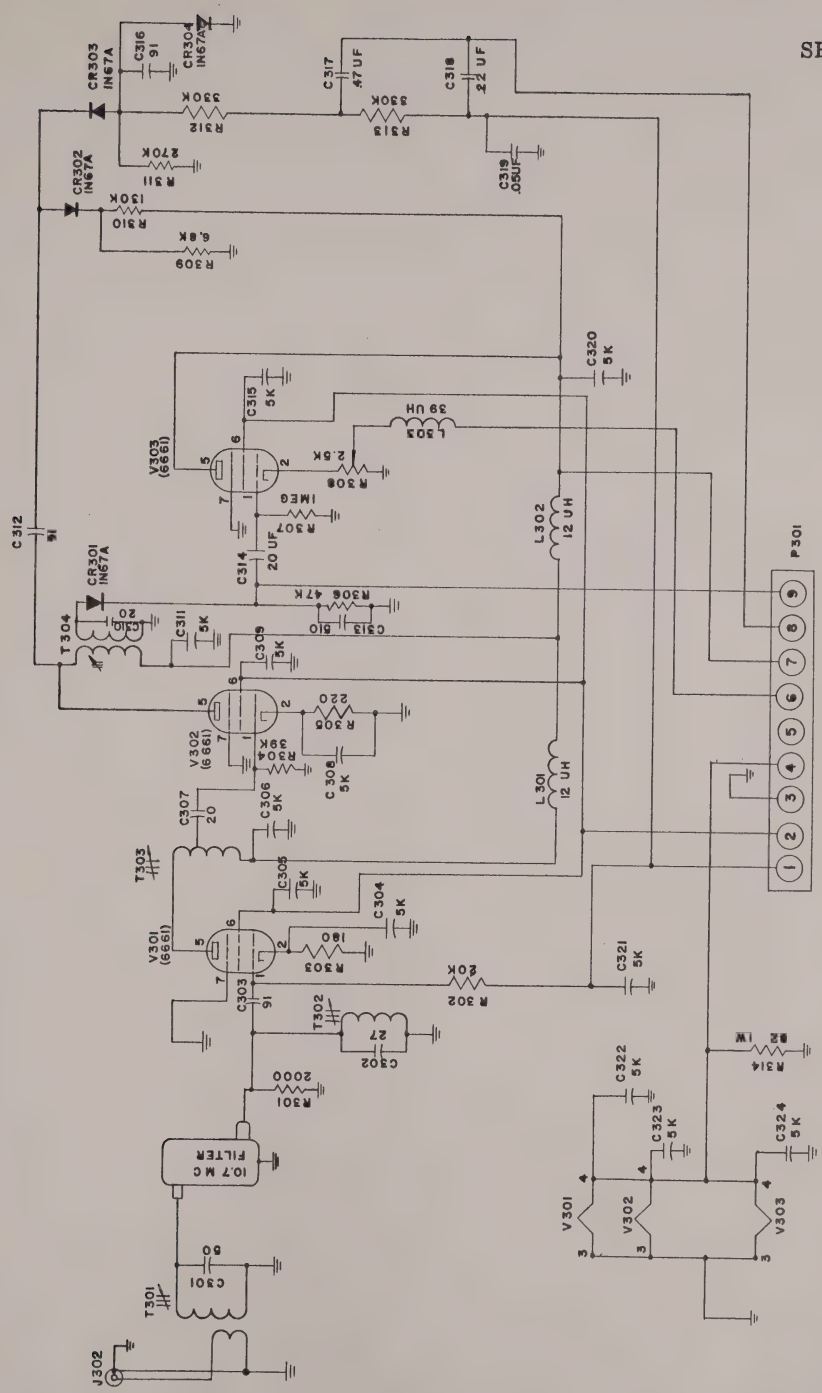


Figure 7-6 DARE DR-560, LF IF Module Schematic Diagram

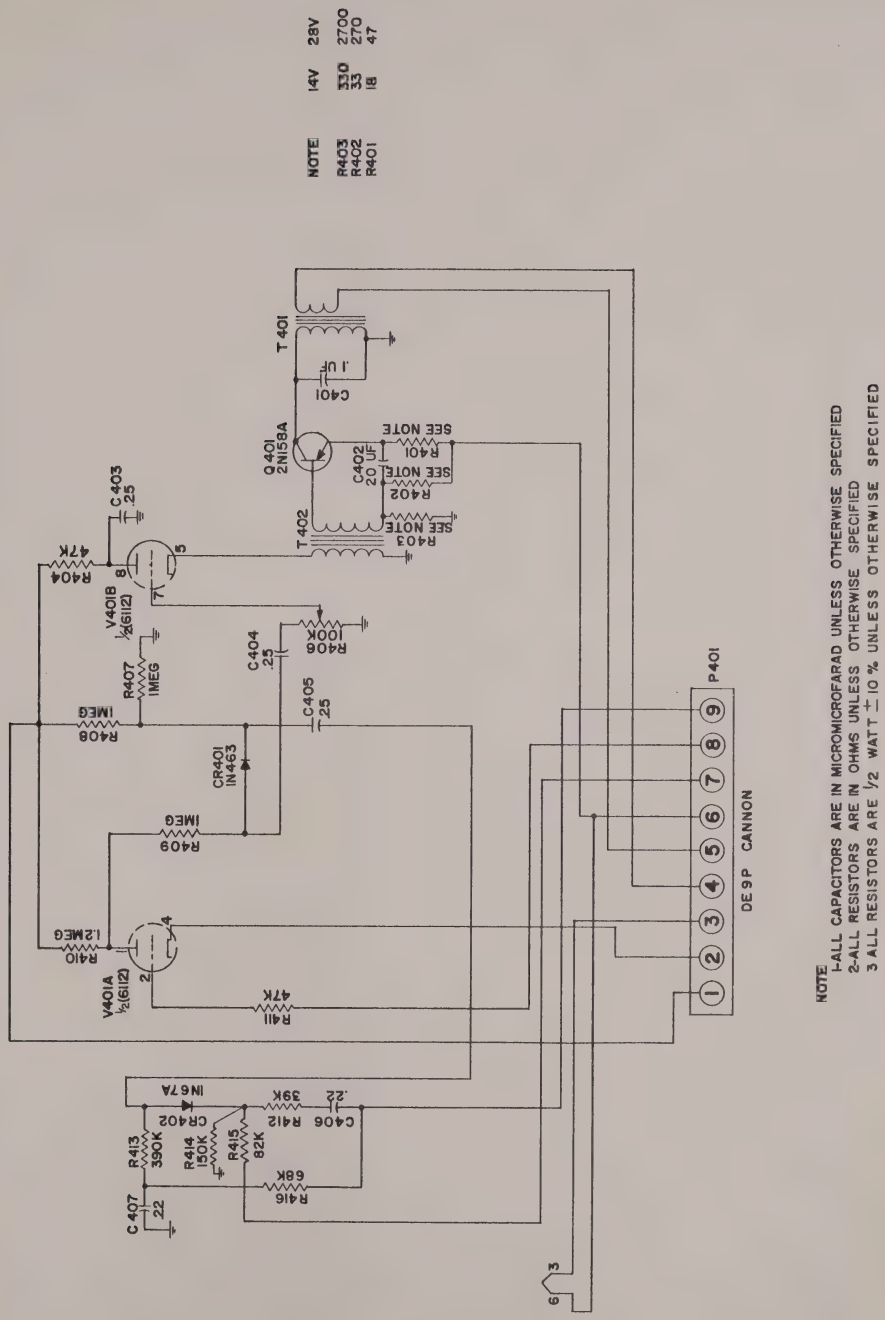


Figure 7-7 DARE DR-560, Audio Module Schematic Diagram

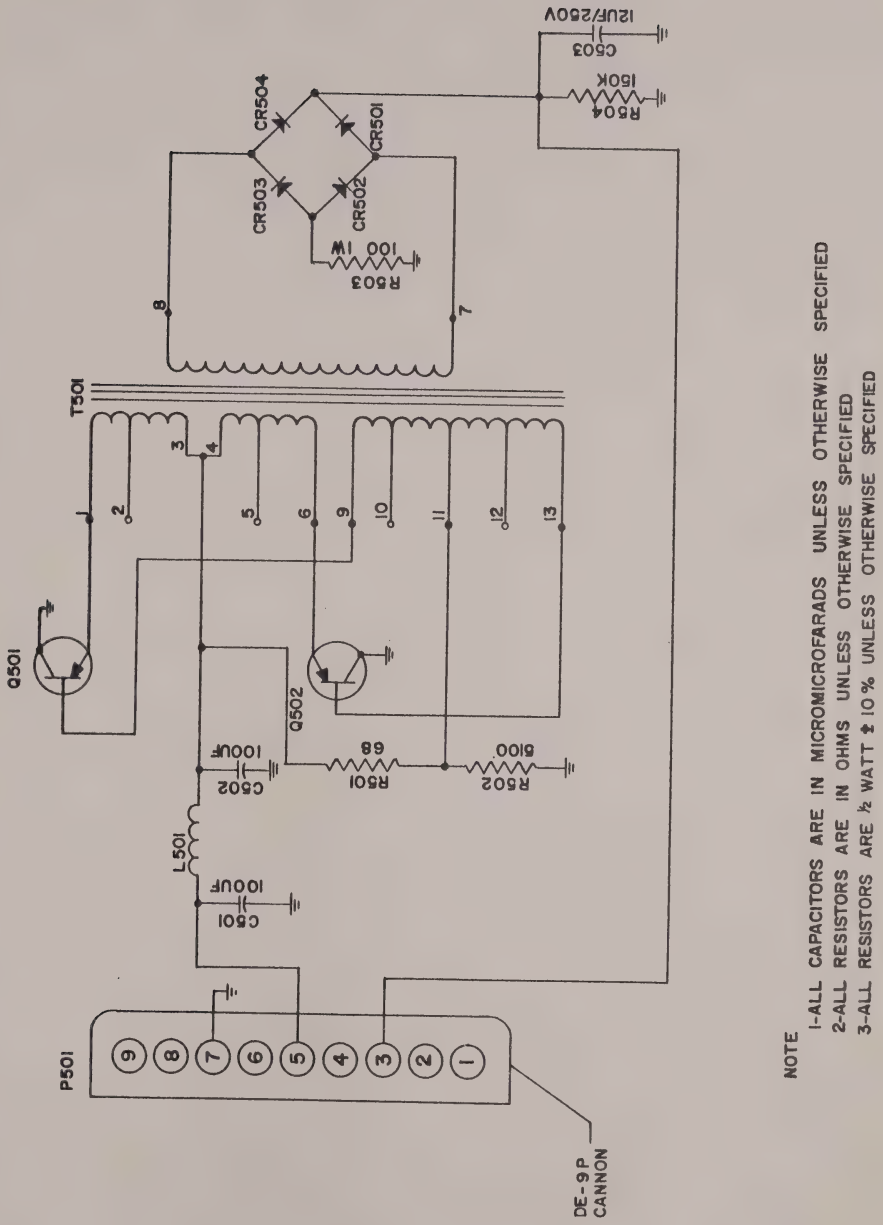


Figure 7-8 DARE DR-560, 28V. Power Supply Module Schematic Diagram

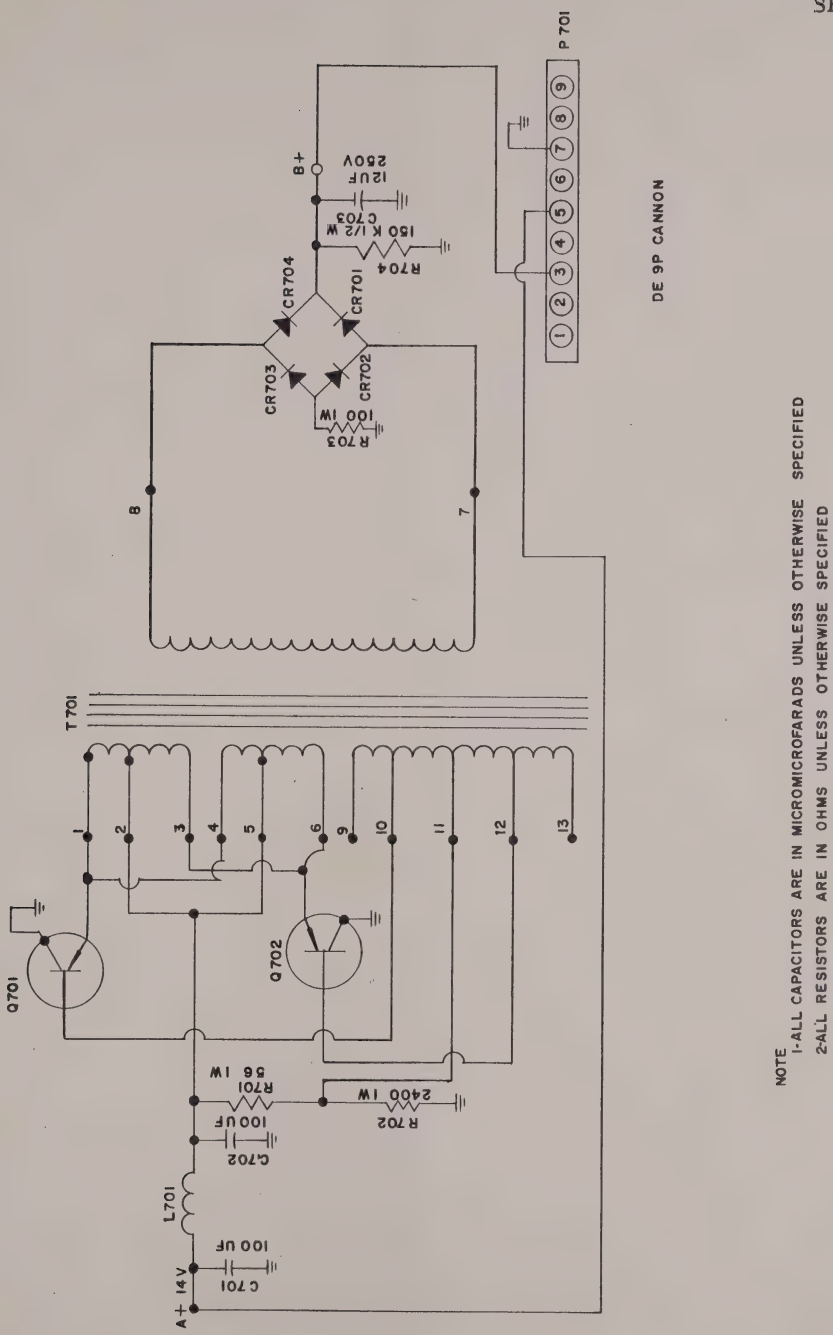
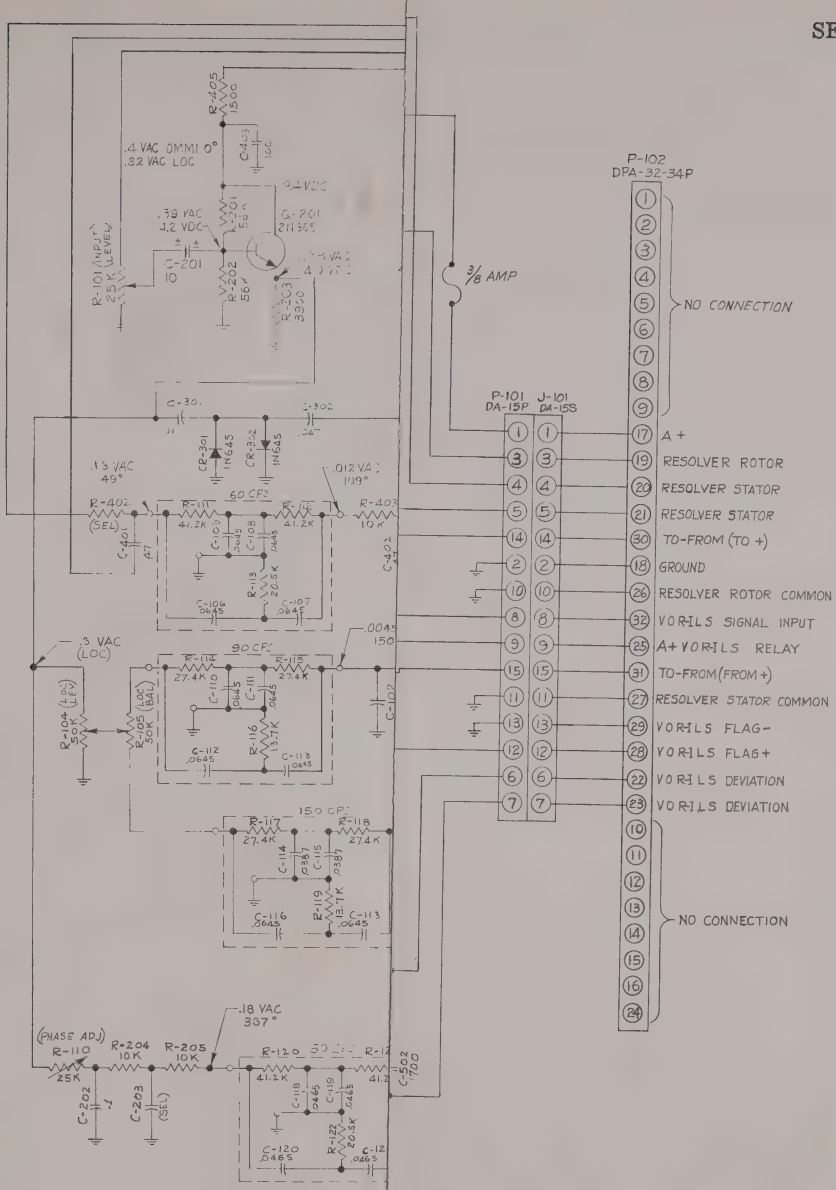
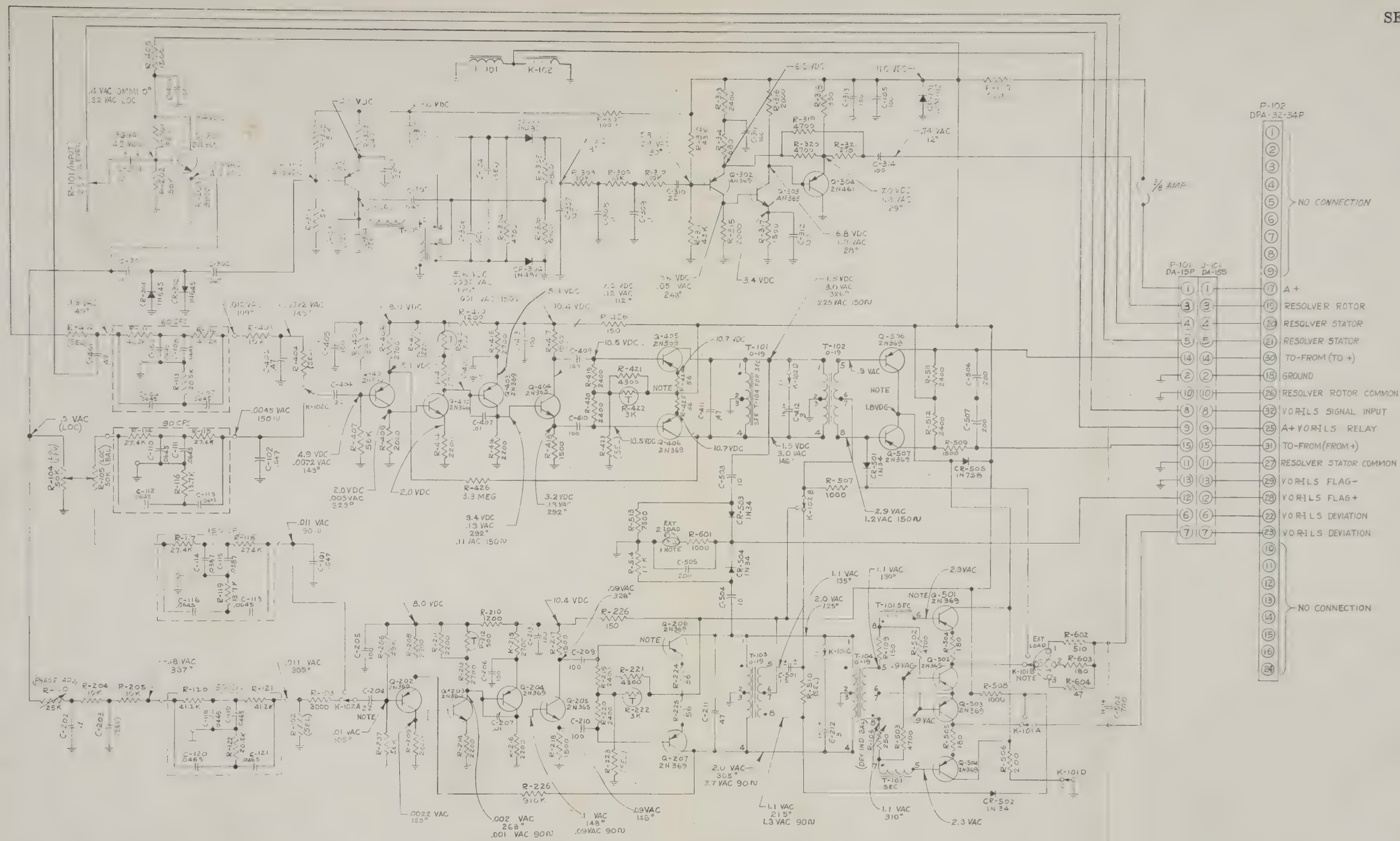


Figure 7-9 DARE DR-560, 14V. Power Supply Module Schematic Diagram



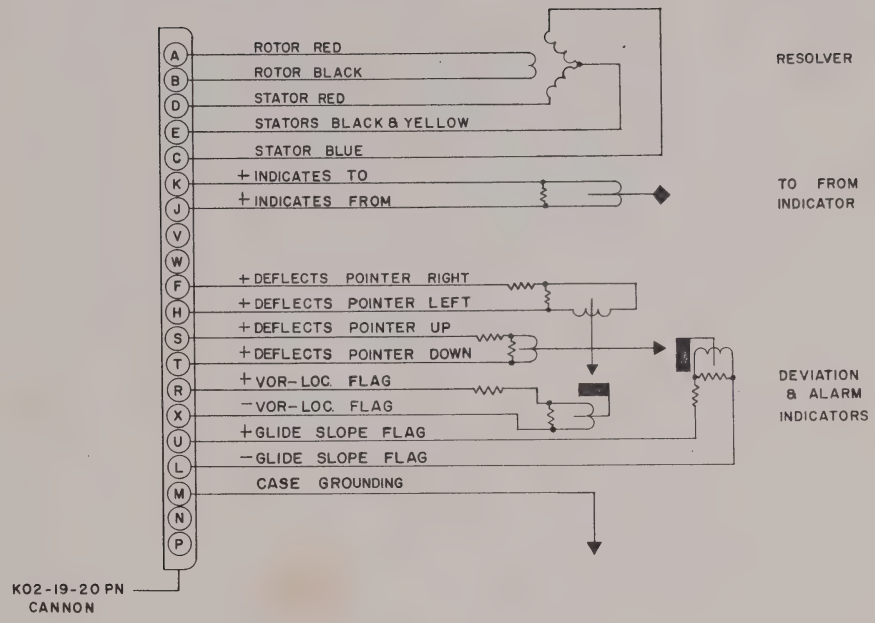
NOTE:-
R-107 28VDC 56 OHM 10W ± 5%
R-107 14VDC 6.8 OHM 1 W ± 5%
R-601 IS SWITCHED OUT IF TWO FL
R-602 IS USED WITH ONE DEVIATIO
R-603 WITH TWO, R-602 WI
ALL RESISTORS ARE IN OHMS UNLESS
ALL CAPACITORS ARE IN MICRO FARA
Q-206 & Q-207 MATCHED PAIR
Q-405 & Q-406 MATCHED PAIR
Q-506 & Q-507 MATCHED PAIR
Q-501, Q-502, Q-503 & Q-504 MATCH
VARIABLE PHASE AMPLIFIER DC VO
ALL AC & DC VOLTAGES MEASURE
ALL AC VOLTAGES MEASURED WIT
ALL DC VOLTAGES MEASURED W
ALL AC VOLTAGES MEASURED
COURSE SELECTOR SET AT 352.5

onverter DNC-4, Schematic Diagram



NOTE:-
R-107 28VDC 56 OHM 10W ± 5%
R-107 14VDC 6.8 OHM 1W ± 5%
R-601 IS SWITCHED OUT IF TWO FLAGS ARE USED
R-602 IS USED WITH ONE DEVIATION INDICATOR
R-603 WITH TWO, R-604 WITH THREE
ALL RESISTORS ARE IN OHMS UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS ARE IN MICRO FARADS UNLESS OTHERWISE SPECIFIED
Q-206 & Q-207 MATCHED PAIR
Q-405 & Q-406 MATCHED PAIR
Q-506 & Q-507 MATCHED PAIR
Q-501, Q-502, Q-503 & Q-504 MATCHED
VARIABLE PHASE AMPLIFIER DC VOLTAGES ARE SAME AS REFERENCE PHASE
ALL AC & DC VOLTAGES MEASURED TO GROUND
ALL AC VOLTAGES MEASURED WITH INPUT LEVEL POT & LOC LEVEL POT SET FULLY CLOCKWISE
ALL DC VOLTAGES MEASURED WITH A VTVM
ALL AC VOLTAGES MEASURED WITH A RMS VTVM
COURSE SELECTOR SET AT 352.5°

Figure 7-10 DARE Navigation Converter DNC-4, Schematic Diagram



NOTE:

1. SERIES AND SHUNT RESISTORS SELECTED TO OBTAIN CORRECT CURRENT DEFLECTION AND RESISTANCE RATINGS

Figure 7-11 DARE Navigation Instrument DNI-2, Schematic Diagram

INSTALLATION & SERVICE INSTRUCTIONS

DARE

DM-3 Marker Beacon Receiver

DARE, INC.
TROY, OHIO

I N S T R U C T I O N B O O K

F O R

D M — 3

M A R K E R B E A C O N R E C E I V E R

DARE

DAYTON AVIATION RADIO & EQUIPMENT CORP.

U. S. ROUTE 25 - TROY, OHIO
COX MUNICIPAL AIRPORT - VANDALIA, OHIO

M A N U F A C T U R E R S O F R A D I O, N A V I G A T I O N

A N D

T E S T E Q U I P M E N T

25 MAY 1939

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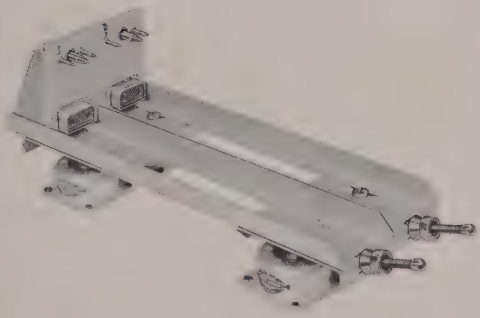
DM-3 on M/MB-1 Shockmount



M/MBGS-2 Dual Shockmount

Kit 3LS (Plate not included)

Figure 1-1 DARE Marker Beacon Rec. DM-3, M/MB-1 or M/MBGS-2 Shockmount and Kit 3LS

SECTION I

GENERAL DESCRIPTION

1.1 PURPOSE

1.1.1 PURPOSE OF INSTRUCTION BOOK

This instruction book is intended to assist in the installation, operation, and maintenance of the DARE DM-3 Marker Beacon Receiver.

1.1.2 PURPOSE OF EQUIPMENT

The DM-3 marker beacon receiver provides to the pilot visual and aural indication of the passage of an aircraft over a 75 mc marker beacon transmitter.

Visual indication of a marker beacon signal is presented by lighting of one of three indicating lamps mounted on or near the pilot's instrument panel. The marker receiver lights one of the indicating lamps for each of the three characteristic tone modulating frequencies associated with the various types of marker transmitting stations. Differentiation between indicators is provided by indicator lens color as well as by panel marking: blue for outer markers; amber for middle markers; and white for airway markers. The receiver can be supplied, on special order, with an audio module which will operate a single lamp to indicate passage over any 75 mc marker beacon transmitter.

Aural identification is provided by frequency and keying of a tone: the ILS outer marker provides a 400 cps tone keyed in dashes; the ILS middle marker provides a 1300 cps tone keyed in alternate dots and dashes; and the airway marker provides a 3000 cps tone keyed for station identification.

Power supply modules are available for operation from a 14 volt or a 28 volt DC power source. The receiver converts from operation on one power source to operation on the other by installing the appropriate power supply module. All modules of a given type are interchangeable without realignment.

1.2 GENERAL DESCRIPTION

1.2.1 MECHANICAL

The complete receiver, including power supply, is housed in a short 1/4 ATR case with a rear connector. Modular construction is used to allow ease of maintenance,

convenience in parts replacement, and flexibility in modification. All modules plug into the frame which includes a bracket containing the normally used controls and test points. See Figure 6-1. All connections to the receiver, including the antenna connection, can be made through a rear panel rack and panel connector in accordance with ARINC recommendations. The antenna can optionally be connected to a front panel connector provided for that purpose. The pilot may select by a toggle switch in his compartment either the high or low receiver sensitivity as set by controls on the receiver frame. The frame also contains a volume control for the aural output. There are no moving parts in the receiver. The dust cover, secured by a single Dzus fastener, provides physical protection to the receiver while allowing adequate ventilation without exposing the top of the unit.

1.2.2 ELECTRICAL

The RF module of the DN-3 Marker Beacon Receiver is a crystal-controlled superheterodyne receiver fixed tuned to 75 mc with an IF of 5.5 mc. It includes an RF amplifier stage and a voltage doubling AGC circuit with delay.

The audio module includes a carrier operated squelch circuit to cut off the receiver output in the absence of a signal and to help provide more positive indicator lamp actuation. Each lamp is driven by a fused-junction power transistor.

In the power supply module two more similar transistors comprise a square wave oscillator whose output is rectified and filtered in order to supply high voltage direct current to the vacuum tubes in the receiver. The design includes features for protecting the transistors against A+ line surges. Two interchangeable power supply modules are available: one for operation from a 14 volt DC source and one for operation from a 28 volt DC source.

The frame contains all wiring necessary to provide interconnection between modules.

1.3 REFERENCE DATA

1.3.1 LIST OF ACCESSORIES

TABLE 1-1 ACCESSORIES FOR THE DM-3

Type Number	Description	Weight
M/MB-1	Shockmount, Single Short ½ ATR, with connector for marker receiver	1.5 lbs.
M/MBGS-2	Shockmount, Dual Short ½ ATR, with connectors for marker and glide slope receivers	2.25 lbs.
Kit 3LS (specify 14 or 28 vDC)	Three indicators (colored, variable intensity, push-to-test) with lamps; miniature toggle switch	1 oz.
M-1	Antenna, Marconi Type	8 ozs.

1.3.2 PHYSICAL SPECIFICATIONS

Size - Short ½ ATR: 2-1/4 x 7-5/8 x 12-9/16 inches.
Weight - 5.9 pounds, including power supply.
Color - DARE gray

1.3.3 ELECTRICAL SPECIFICATIONS

In accordance with RTCA Paper 87-54/DO-57.

Receiver Type.....Single conversion superheterodyne.

Signal Frequency.....75 mc, crystal controlled ± 0.005%.

Input Impedance.....52 ohms

Sensitivity.....High sensitivity variable from 20 to more than 5000 microvolts, low sensitivity variable from high sensitivity setting to more than 10,000 microvolts.

Visual Indicators....In 28 volt aircraft, Type 330 lamps (rated 14 volts, 80 ma.)or equivalent.

In 14 volt aircraft, Type 328 lamps (rated 6 volts, 200 ma.)or equivalent.

GENERAL DESCRIPTION

Aural Output ..... 100 milliwatts into a 500 ohm load with less than 30% distortion

Power Requirements — Excluding lamp current
28 volts D.C. at 1.0 ampere, or
14 volts D.C. at 2.0 amperes

TABLE 1-2 TUBE, TRANSISTORS, AND DIODE COMPLEMENT

Schematic Symbol	Type	Function
V101	5749	RF Amplifier
V102	5654	Mixer
V103	5654	First IF Amplifier
V104	5654	Second IF Amplifier
V105	5670	Local Oscillator
V301	5751	Squelch; Audio Amplifier
V-302	5814	Audio Output; Transistor Driver
Q201 & Q202	2N2459 or 2N2868A in 28V power supply 2N2242 in 14V unit	Square-wave Oscillator
Q301	Special 2N257	3000 cps Lamp Amplifier
Q302	Special 2N257	1300 cps Lamp Amplifier
Q303	Special 2N257	400 cps Lamp Amplifier
CR101	1N67A	Audio Detector
CR102	1N67A	AGC Detector
CR103	1N67A	AGC Detector
CR201	1ES1	B + Rectifier
CR202	1ES1	B + Rectifier
CR203	1ES1	B + Rectifier
CR204	1ES1	B + Rectifier

SECTION II
INSTALLATION

2.1. PREPARATION

The DM-3 Marker Beacon Receiver may be mounted in any convenient location in the aircraft. Installation diagram Figure 7-1 on page 7-1 is provided for your convenience. Consideration should be given to antenna lead length and power wire lengths. The set requires no adjustments in flight except the HI-LO switch that is accomplished by remote control. The aircraft ignition, generator and lighting system should have good shielding and noise filter. Additional installation and modification information is contained on Figure 7-3, overall schematic diagram. Notes 3 and 4 must be followed.

2.2 MOUNTING

2.2.1 RECEIVER

The M-MB-1 or M-MBGS-2 shockmount should be mounted permanently to a rigid surface so that the mounting will be in a horizontal position in level flight. Sufficient clearance must be allowed for maximum travel of the receiver through the range of the shockmount. The receiver is fastened to the shockmount by one quick-disconnect for convenience of removal.

2.2.2 INDICATORS

Indicators, 1 blue, 1 amber, and 1 white plus a HI-LO miniature switch in Kit 3LS for custom installation with instructions available for purchase as an accessory for the DM-3 Marker Beacon Receiver. (Requires 1 1/4" and 3 15/32" holes)

2.3 CONNECTIONS

2.3.1 ANTENNA CONNECTIONS

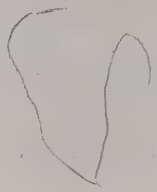
Any standard marker beacon antenna, such as the DARE M-1 Marconi type antenna may be used. Connections may be made with RG58A/U coaxial cable. Enough slack should be allowed at the receiver end for full movement of the receiver shockmount.

2.3.2 POWER AND CONTROL WIRING

Power and control wires should be as short as possible and conform with good standards of an aircraft installation. Power lines to DC buss and ground may be # 18 wire. All other circuits # 22 or larger.

Note: Power should be supplied from the battery or from a battery-loaded generator. Power variations from an unloaded generator may damage transistors .

Separate power connections are provided for 14 and 28 volt operation. This protects the receiver against



2.3.2. POWER AND CONTROL WIRING (Continued)

damage upon insertion into test racks with improper input voltages when both sets are available.

After installation is complete and power is applied to aligned receiver (less dustcover) peak antenna coil L101 so maximum sensitivity may be obtained.

The following table 2-1 is provided for assistance in wiring of main plug.

TABLE 2-1 FUNCTIONAL PLUG CONNECTIONS

Pin No.	Function
1	Ground
2	Lamp common
3	Blue (outer-400 cps)
4	Amber (middle-1300 cps)
5	White (airway-3000 cps)
6	+27.5 VDC
7	Audio output 500 ohms
8	Audio output (ground for audio output)
9	N.C.
10	Sensitivity switch
11	Sensitivity switch ground
12	N. C.
13	N. C.
14	N. C.
15	N. C.
16	N. C.
17	N. C.
18	+13.75 VDC
19	N. C.
20	A.G.C. Test
21	N. C.
22	Lamp Test
A1	Rear Antenna Connection (see note 4 on Figure 7-3)
A2	N. C.

NOTE: N. C. designates No Connection.

SECTION III

OPERATION

Note: DO NOT operate on an unloaded aircraft generator. See Section 2.3.2

3.1 OPERATION

3.1.1 GENERAL

The DM-3 Marker Beacon Receiver operates continuously whenever the aircraft system is supplied with power. The only in-flight control utilized is the selection of HI and LO sensitivity.

In-operation check on the condition of the indicator lamps and primary power to the receiver is performed by depressing the indicator lamp lens which applies DC power to operate the lamp.

3.1.2 ADJUSTMENTS

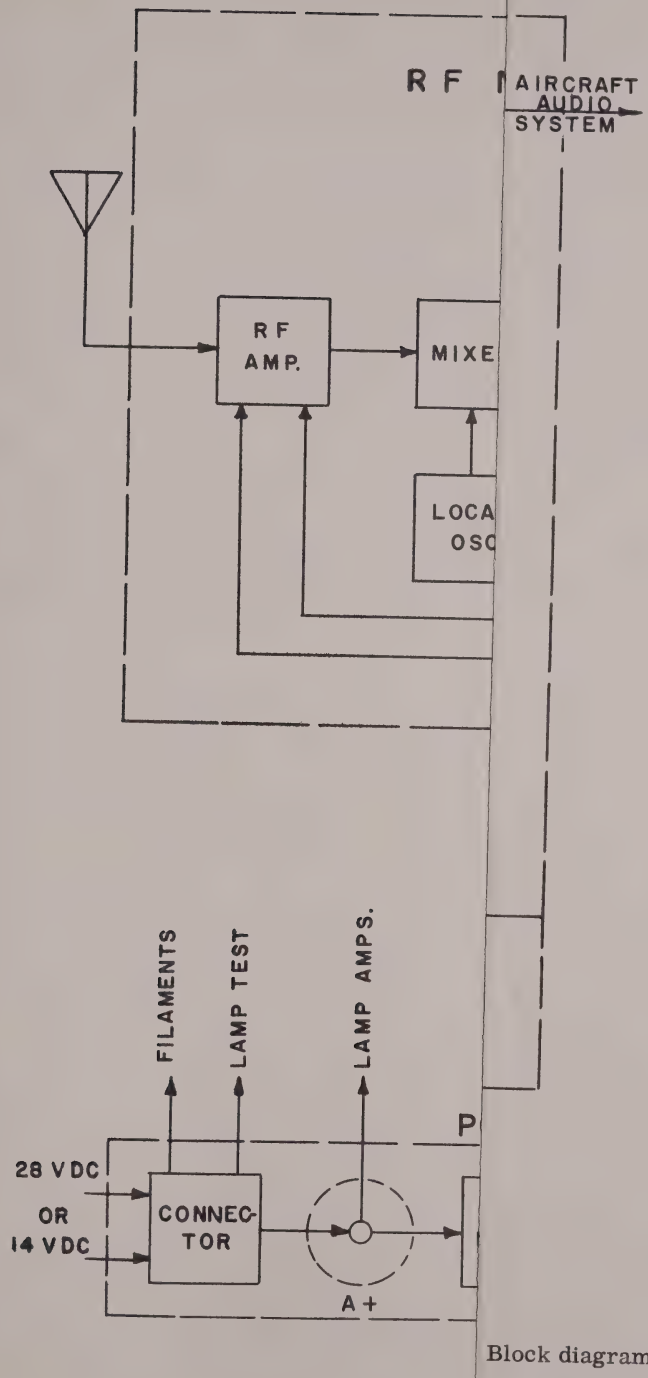
Lamp dimming (with DARE Kit 3LS) is accomplished by turning the indicator lamp lens clockwise. The fully clockwise position leaves, for safety, a thin ring of illumination. Full indicator illumination is obtained by turning the indicator lamp lens approximately 1/4 turn CCW. Continued CCW rotation removes lamp lens for lamp replacement.

Aircraft audio distribution systems are not standardized The control operations necessary for making audible the marker signals should be determined according to the particular installation involved.

Should a change in the receiver's "High" or "Low" sensitivity adjustments (on the receiver frame) be desired, qualified personnel may re-set R-401 and/or R-402 according to the procedures of section 5.2.2 (b).

3.1.3 FLIGHT TEST

For a particular installation an aircraft with the receiver installed and operating should be flown over a marker station of proven reliability and the receiver sensitivity adjustments varied to produce lamp actuation of duration as shown in a standard Airway Marker Station Radiation Pattern Chart(approximately 10 seconds). Check HI-LO sensitivity switch for proper operation. Note blue lamp operates when over the outer marker and a 400 cps tone keyed in dashes is heard. Note amber lamp operates when over the middle marker and a 1300 cps tone keyed in alternate dots and dashes is heard and the white lamp operates when over the airway markers with a 3000 cps tone keyed for station identification.



Block diagram

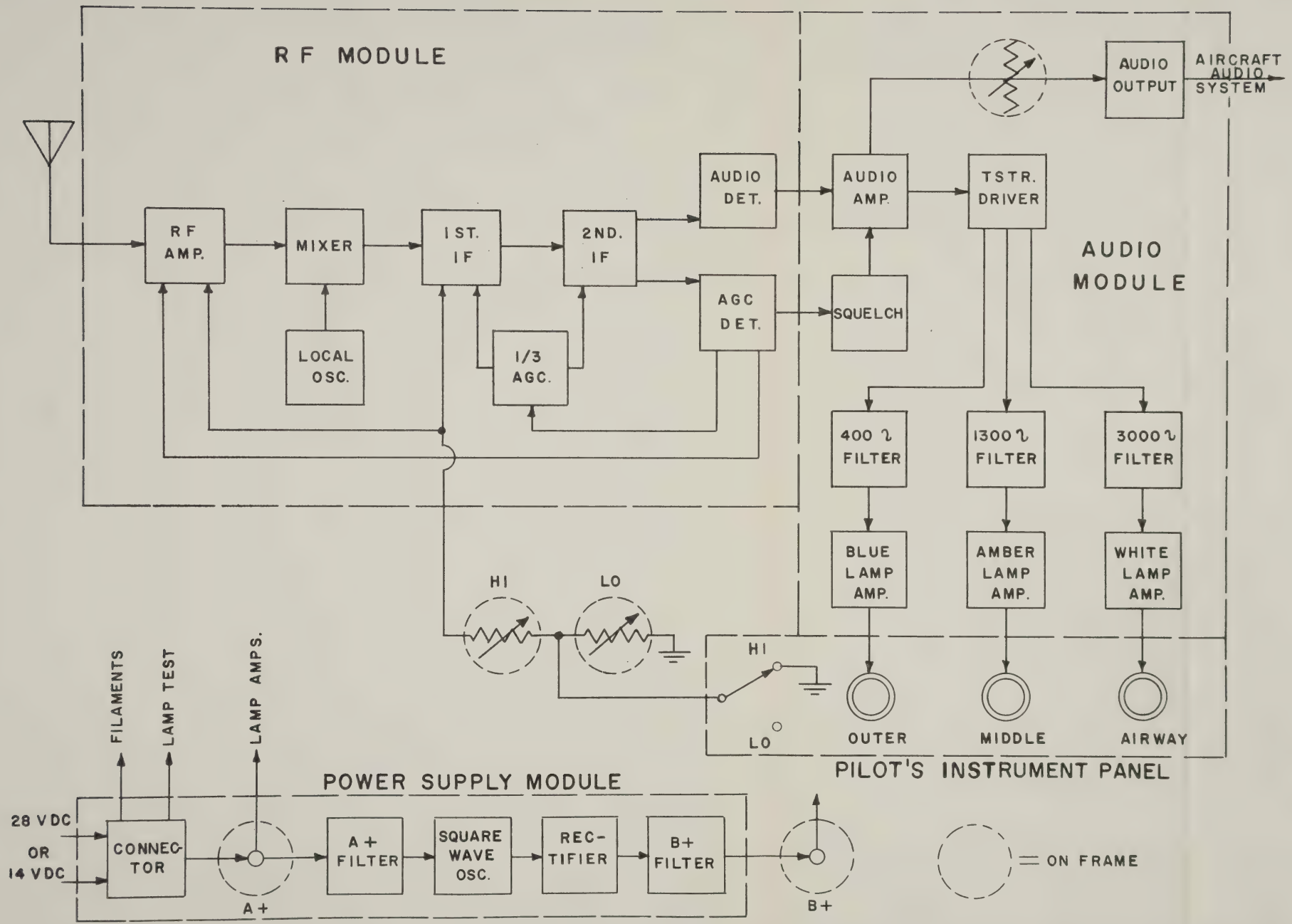


Figure 4-1 DARE Marker Beacon Rec. DM-3, Block diagram

SECTION IV

THEORY OF OPERATION

4.1 PRINCIPLES

The following principles of operation are given with reference to the block diagram of Figure 4-1.

The aircraft marker beacon antenna picks up the 75 mc marker signal which is introduced into the RF amplifier stage of the receiver's RF module. The amplified signal is then applied to the grid circuit of the mixer stage. Also applied to the mixer grid circuit is the output of the 69.5 mc local oscillator. The difference-frequency signal, 5.5 mc, in the mixer output is applied to the grid of the first IF amplifier.

The IF signal, after being amplified by the two cascaded IF stages, is applied to two detector circuits: the audio detector and the automatic gain control (AGC) detector. Consider first the AGC (or AVC) output. Full AGC voltage is applied to the RF amplifier stage. The AGC voltage is reduced to 1/3 full value and applied to the two IF amplifier stages. The AGC voltage is also applied as the controlling voltage in the squelch circuit of the audio module.

The output of the audio detector is applied to the audio amplifier stage in the audio module. The associated squelch circuit determines whether or not there can be output from this audio amplifier. Signal from the audio amplifier is fed to two more amplifiers. Consider first the aural channel: signal is fed through the audio gain control to the audio output stage and then to the aircraft's audio distribution system.

The output of the transistor driver stage is applied to three tone filters - one for each of the characteristic tone modulating frequencies utilized by marker beacon transmitters. Each filter will pass its tone and reject the other two. Each of the three tone filters is followed by a transistorized lamp amplifier.

On the pilot's instrument panel an indicating lamp is driven by the output of each lamp amplifier. Thus, when the aircraft passes over a marker beacon transmitter, the pilot hears the transmitter's modulating tone and its keying and sees the same signal as a flashing indicator lamp.

The toggle switch in the pilot's compartment controls receiver sensitivity, high or low, by changing the value of a resistance in the RF amplifier and first IF amplifier stages.

The bulk of the power supply module is devoted to producing B-plus voltage for the vacuum tubes of the receiver. The module

4.1 PRINCIPLES (continued)

connector however, is used to switch filament and lamp test circuitry in accordance with the power source voltage to be used. The selected A-plus voltage is applied to the A-plus test point, to the transistor lamp amplifiers, and to a surge and hash filter preceding a transistorized, square-wave, power oscillator. This oscillator's output is rectified and filtered to provide the B-plus voltage for the receiver.

4.2 CIRCUITS

The following circuit descriptions are given with reference to the overall schematic diagram of Figure 7-3.

4.2.1 RF MODULE

Marker Beacon signals from the antenna may be connected to the receiver at its front panel jack J404 or at the rear panel, with the other receiver wiring, at Pin A1 of P401. The corresponding miniature coaxial cable connector, P402 or P403, connoots the signal to the receiver input at J101 of the RF module.

The receiver's input circuit is completely shielded in one enclosed end of the RF module chassis. Antenna coil L101 and RF amplifier grid coil L102, within this enclosure, are both slug tuned to 75 megacycles. AGC voltage for the RF amplifier is applied through a decoupling network to the RF-ground end of L102.

The cathode of the RF amplifier tube returns to ground through the sensitivity controls on the frame, R401 and R402, as does the cathode of the first IF amplifier tube V103. Each of these cathodes has its own RC decoupling filter. RF choke L105 helps to isolate the cathode of V101 from extraneous RF signals. R401 and R402 control receiver sensitivity in the following manner: increasing the cathode resistance increases the voltage drop across same; this increases the effective negative grid bias which reduces stage gain.

Screen grid voltage for V101 is supplied from a voltage divider for more positive AGC action. The RF amplifier plate coil L103 couples the amplified 75 mc signal to the mixer grid coil L104. Both of these coils are slug tuned to 75 mc.

The RF ground end (bottom) of L104 is bypassed by C111. The value of this capacitance is considerably smaller than that of other RF bypasses so that the local oscillator

4.2 CIRCUITS (continued)

may develop its injection voltage across C111. The oscillator signal is coupled to C111 by C112 from a miniature coaxial cable leading to the oscillator circuit which is completely shielded in the other end of the RF module chassis.

The dual-triode oscillator circuit is used for its stable, reliable operation with fifth-harmonic, series-resonant quartz crystals. The first section of oscillator tube V105 (pins 2, 3 and 4) is used in a cathode follower stage - input on the grid and output from the cathode. The second section (pins 6, 7 and 8) is a grounded grid amplifier - input on the cathode and output from the plate. Thus the two amplifiers are well suited to driving one another in a loop arrangement. Coupling from the cathode follower output to the grounded grid input (between cathodes) is through the series-resonant crystal Y101. L106 and C140, slug tuned to 69.5 mc, form the plate load for the grounded grid amplifier. The oscillator loop is completed by C138 which couples energy from the tank circuit to the cathode follower grid. Output from the oscillator circuit is obtained from the cathode follower stage. Test point E104 is provided, with isolating network R124-C136, to enable VTVM reading of the DC grid voltage resulting from grid-rectified oscillations.

Back at the mixer stage V102, the 75 mc. marker signal and the 69.5 mc. local oscillator signal are in series in the grid circuit. The plate circuit output is through the first IF transformer T101 at 5.5 mc. to the grid of the first IF amplifier tube V103. For alignment purposes a 5.5 mc. signal from a signal generator may be inserted at E101. In this case the mixer stage functions as a grounded grid amplifier. The first IF amplifier stage drives the second IF amplifier stage V104 through T102. AGC voltage for the two IF amplifier stages is reduced to approximately 1/3 its full value by the voltage divider R110-R111. The IF output transformer T103 is adjusted for tight coupling between its primary and secondary in order to properly drive the following two detector circuits.

The load for audio detector diode CR101 is R119 and C130. Test terminal E102 is provided to enable VTVM reading of the diode load voltage (positive DC).

The AGC circuit is a separate terminal-board sub assembly of the RF module. It is similar to conventional power-supply voltage doubling circuits except for the delay voltage (approximately 5 volts positive) applied to the AGC circuit by voltage divider R120-R121 from the B+ supply line.

4.2 CIRCUITS (continued)

When terminal C of T103 attains a positive voltage greater than the delay voltage, C131 is charged by conduction through CR102. During the next half-cycle of IF signal, terminal C is negative so the IF signal adds in series with the C131 voltage. The sum voltage is applied to C133 by conduction through CR103. During both half-cycles the path to ground is completed by C132. Thus C133 can be charged to approximately twice the peak IF signal level. Load resistor R122 and audio filter R123-C134 complete the AGC detector circuit. Test terminal E103 is provided for convenience in VTVM reading of the developed AGC voltage (negative DC).

In accordance with ARINC recommendations the AGC voltage is made available for testing outside the receiver through Pin 20 of rear connector P401.

4.2.2 AUDIO MODULE

The receiver's squelch circuit is that of dual triode V301. V301A (pins 6, 7 and 8) functions as a conventional audio amplifier of the RF modules audio detector output except for its direct coupling to squelch triode V301B (pins1, 2 and 3). Voltage divider R306-R307 assigns approximately 40 volts from the B+ supply to the function of squelch tube supply voltage. V301B's plate load resistor R308 is the direct current coupling element because it is also in the grid return circuit of V301A. At any given time only one of the V301 triodes will be conducting. For example: when no signal is being received no AGC voltage is applied to the squelch tube's grid. The squelch tube conducts, developing a voltage across R308 of polarity and magnitude sufficient to bias the audio amplifier to cutoff. When a sufficiently strong signal is being received, enough AGC voltage (approximately 1.5 volts) is applied to the squelch tube to cut it off. Then there is no voltage drop across R308 and the audio amplifier operates normally.

The audio output circuit of V302A is conventional. The audio gain control R403 (located for convenience on the receiver's frame) is in its grid circuit. Values of C302 and C303 are chosen to attenuate the aural output at frequencies below 400 cycles and above 3000 cycles. Aural output transformer T301 is connected for a 500 ohm output impedance with neither side necessarily grounded.

The transistor driver, V302B, receives its audio input from audio amplifier V301A. A cathode follower circuit is used in order to provide a low impedance signal source

4.2.2 AUDIO MODULE (continued)

for lamp amplifiers Q301, Q302 and Q303. These three transistorized lamp amplifiers are identical except for the series-resonant LC filter connecting the transistor base to the transistor driver. Highly reliable and precision filter components make filter adjustments unnecessary.

Consider any one of the transistor lamp amplifier circuits. The germanium-base, fused-junction, PNP-type, power transistor is arranged in a common emitter circuit operated class B. The emitter is connected to the A+ line which, for audio signal purposes, is at ground potential. (In 28 volt aircraft installations a negative-feedback resistor is inserted between emitter and A+ in order to decrease lamp sensitivity and transistor dissipation). The input circuit includes a voltage limiting resistor between base and emitter. In the output circuit current-flow is from emitter to collector through the pilot's indicator lamp to ground. Emitter-base current flows only during the negative half-cycle of driver output. Emitter-collector current (output current) flows only when input current does so the output waveform has the appearance of an amplified and half-wave-rectified input waveform. Accurate measurements of the DC equivalent value of this output can be made with a conventional DC voltmeter.

4.2.3 POWER SUPPLY MODULE

Frame wiring and power supply connector P201 wiring is arranged so that several switching functions are automatically performed by removing a 28-volt power supply module and inserting a 14-volt power supply module, or vice-versa. Filament switching (with pins 3, 7 and 14 of P201) is discussed below. A+ switching is done with pins 4, 5 and 6 in a manner that allows any given receiver to safely have 14 and 28 volt sources connected simultaneously to their respective pins (18 and 6) of rear connector P401. Lamp test voltage is applied to Pin 22 of P401, in 28 volt sets, from the A+ test point E402 through resistors R404 and R405. In 14 volt receivers R404 is jumpered by its connection to pin 13 of P201. Pins 2 and 10 of P201 are used only in the companion DARE glide slope receiver DGS-20, which uses the same power supply modules. Pin 12 returns input power from the A+ test point to the power supply proper.

The following circuit description applies to either power supply module. The major difference between modules is that the transistors of the 28-volt supply must withstand higher peak voltages (approximately twice A+ voltage).

THEORY OF OPERATION

4.2.3 POWER SUPPLY MODULE (continued)

The A + input surge and hash filter is composed of L201, C201 and C203. The square wave oscillator includes the two transistors, the T201 primary winding (connected to transistor collectors), the T201 control winding (connected to transistor bases), and resistors R201,R202, R205 and R206 . In some units R-207 and C-204 are used to eliminate primary switching "spikes".

This oscillator performs much the same function as does a vibrator in a vibrator power supply. That is, the primary power is applied alternately across halves of the primary winding. To follow one square wave cycle consider A + current flowing from the filter output (C203) through R205, from Q201 emitter to Q201 collector through the top half of the T201 primary to ground. This current (of approximately saw-tooth waveform) will induce a voltage in the control winding which will cause Q201 to conduct more heavily while cutting off Q202. The core of T-201 has a rectangular hysteresis loop and is easily saturable . When the Q201 current saturates the core, transformer action ceases. The control-winding voltage disappears. The Q201 current decreases, immediately bringing the transformer core out of saturation. Thus transformer action is restored and the decreasing Q201 current causes reversed polarity control-winding voltage which cuts off Q201 while causing conduction through Q202 and the bottom half of the T201 primary. This cycle repeats at a rate of approximately 400 cps. The voltage divider R201-R202 biases the transistor control loops (emitter-base) to provide proper starting conditions. The small resistors in the emitter leads, R205 and R206, function as do cathode resistors in a vacuum tube cicuit. That is, they provide negative feedback for increased stability and safety.

The two transistors need not be closely matched, although matched pairs are used in original equipment. The transistors must be able to withstand peak inverse voltages of twice the A + voltage. Should a B + short or overload occur (B + equivalent-load resistance of less than approx. 2300 ohms) the oscillator will assume an extremely high frequency oscillation of small amplitude and negligible B + voltage will be produced.

The T201 secondary winding (terminals 6 and 7) contains sufficient turns to provide square wave voltage of approximately 200 volts peak, no load. This voltage is full wave rectified by the silicon diode bridge composed of CR201, CR202, CR203, and CR204. The diodes conduct in pairs alternate half-cycles; CR201-CR204 and then CR202-CR203. The negative output terminal is at test point E201 while the positive output is the B + line.

THEORY OF OPERATION

4.2.3 POWER SUPPLY MODULE (continued)

Output filtering is accomplished by C202 and R203. Filter requirements are light because of the square wave operation. R204 is included as a safety feature to discharge C202 and serve as a minimum B+ load in the absence of other loads.

The value and circuit placement of R203 is chosen to enable convenient measurement of total B+ current drain. The voltage at E201 (negative with respect to ground) when multiplied by 10 gives current drain in milliamperes. For instance: if E201 measures -6 volts total B+ current drain is 60 milliamperes.

B+ voltage is approximately 170 volts under normal current drain of 50 to 60 ma. B+ terminals of power supply module connector P201 are pins 8, 9 and 10. Ground is applied at pin 1.

4.2.4 FILAMENTS

The following description is given with reference to the filament diagram of Figure 4-2.

The marker receiver has seven 6.3 volt filaments. Resistor R133 functions as an eighth filament. Four series pairs of filaments are arranged for parallel connection to 13.75 volts DC. In receivers operated from 14 volt DC power sources this arrangement is obtained in the power supply module connector T201 by applying A+ to pins 7 and 14 and ground to pin 3. RF chokes and bypass capacitors are used in order to insure that RF energy does not appear on the filaments. The inherent resistance of the chokes and resistors R131, R134 and R305 adjust applied voltage to within 5% of the rated filament voltage.

For 28 volt operation, pins 7 and 14 of power supply connector P201 have no connections and 27.5 volts DC is applied to pin 3. Current of 350 ma. flows in the series string V302, V301, V105 and V101 shunted by R132. R132 normally carries only 50 ma. R132 is a three watt resistor, however, for safety in case of V101 filament burn out. Current of 175 ma. flows through R133, V104, V103 and V102.

Should the power supply module be removed from the frame none of the receiver circuits will receive power. Should the RF module be removed from the frame the filaments of the audio module will not light. Removing the audio module from a 28 volt receiver will disable V101 and V105; in a 14 volt receiver none of the remaining filaments will be affected. In 14 or 28 volt receivers any combination of vacuum tubes can be removed with power on without endangering the remaining filaments.

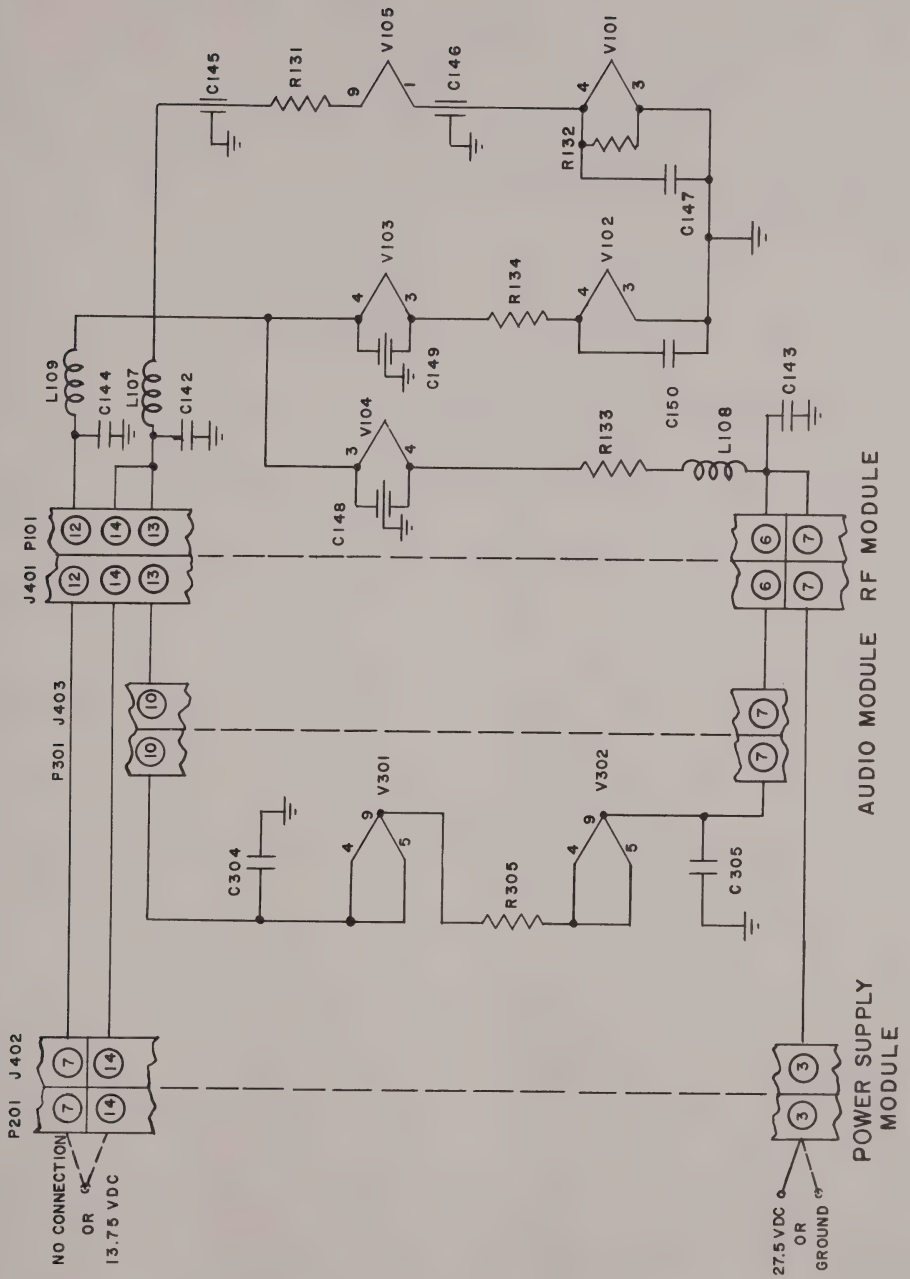


Figure 4-2 DARE Marker Beacon Rec. DM-3, Filament diagram

SECTION V

MAINTENANCE

5.1 ROUTINE MAINTENANCE

5.1.1 VISUAL INSPECTION

This inspection is to be performed with the equipment installed in the aircraft.

a. Inspect the antenna for damage.

b. Check the antenna lead-in and connecting wiring for sharp bends and/or cracks.

c. Inspect the shockmounting for security of installation and condition of the grounding straps.

d. Check the connector cabling and the antenna plug for damaged wiring and corroded contacts.

e. Remove the equipment from its shockmount, and remove the dust. cover. Inspect the modules for security of installation and for evidence of overheating.

f. Before replacing the receiver in its shockmount, make sure that the connector on the shockmount is mounted on the front surface of the panel. Seat the receiver firmly and squarely against the back of the mount to insure good connection. Screw the knurled hold-down nut up snugly against the receiver, and safety wire the installation. Check the sway space on either side of the receiver to be sure that it can vibrate in its mounting within the tolerance of the installation. This will also serve to check the condition of the shockmount vibration dampeners.

5.1.2 PRE-FLIGHT CHECK

a. Apply power to the receiver.

b. Check the press-to-test type indicator lights by pressing on each light. Each should light when the cover is depressed. Open the dimming shutters, if necessary, by turning the cover counter-clockwise slightly.

c. Set the sensitivity switch to its high sensitivity position.

d. Operate controls of the aircraft's audio distribution system as necessary to make audible the marker receiver's output.

e. Approach the airplane with a 75 mc portable marker beacon test generator such as the DARE MBG-1. Adjust modulation to 95% at 400 cps. At a distance prescribed by experience for the type of installation involved, the ILS outer marker indicator should light and the tone should be heard. Check the HI-LO switch for operation. Repeat this procedure with 1300 cps modulation for the middle marker indicator and with 3000 cps modulation for the airways marker indicator.

5.1.3 BENCH TEST

Periodically, the DM-3 receiver should be removed from the airplane and submitted to a bench test to determine its suitability for continued inflight service. If a bench test harness is not available, it may be wired in accordance with the cabling diagram of Figure 7-2. The following tests will determine whether the receiver is operative. If it does not pass these tests refer to Section 5.2.

a. Insert indicating lamps appropriate to the power source: 14 volt type 330 lamps for 28 volt receivers; 6 volt type 328 lamps for 14 volt receivers.

b. Remove the dust cover and check the receiver's R311 arrangement for compliance with Note 3 of Figure 7-3.

c. Apply appropriate power to the receiver: 13.75 or 27.5 volts DC as measured at A+ test point E402.

d. Adjust the signal generator to 75 mc, with 95% modulation at 400 cps. Increase generator output to a level sufficient to operate the receiver (250 to 10,000 microvolts depending on sensitivity control settings often encountered). With an input signal level somewhat higher than that first causing aural output, the lamp voltage obtainable should be at least half the lamp's rated voltage -7 or 3 volts. This voltage (positive DC) may be read from the body of the appropriate transistor to ground (if care is taken not to short the transistor) or across the lamp.

e. Repeat step d. for modulation frequencies of 1300 and 3000 cps.

5.2 CORRECTIVE MAINTENANCE

5.2.1 TEST EQUIPMENT REQUIRED

The following test equipment is required for complete servicing of the DARE Marker Beacon Receiver DM-3.

(a). Power Source: 13.75 or 27.5 volts DC at 2.5 amperes maximum.

(b) Equipment Test Harness: Fabricated in accordance with requirements similar to those contained in the cabling diagram of Figure 7-2.

(c) Module Extension Cable: Amphenol connectors 57-20140 and 57-10140 connected straight through with 14 lengths of #22 insulated flexible wire, each approx. 1 foot long.

(d) Volt-Ohm Meter: 20,000 ohms/volt Simpson Model 360 or equivalent.

(e) DC VTVM: Heathkit V-7 or equivalent.

(f) IF Signal Generator (High impedance output): Federal Model LP-5 or equivalent.

(g) Audio Output Meter: DARE OM-1 or equivalent.

(h) VHF Signal Generator covering 75 mc with amplitude modulation capabilites up to 95%: Hewlett Packard Model 608D or equivalent.

(i) Audio Signal Generator to modulate the VHF Signal Generator: Hewlett Packard Model 200CD or equivalent.

NOTE: In many tests the DARE Marker Beacon Generator MBG-1 may be substitued for Items h and i.

The following sub-divisions of maintenance instructions are given in the module order most useful for a complete servicing of the equipment. The same order will be practical for trouble shooting.

5.2.2 FRAME

(a) Wiring Check

Should visual inspection or other information indicate possibility of opens or shorts in frame wiring, the wiring can easily be checked by reference to the schematic diagram of Figure 7-3. On removing the three modules from the frame all frame wiring connections are easily accessible to use ohm meter probes.

(b) Sensitivity Setting

The following procedure for sensitivity adjustment assumes the receiver to be in otherwise normal operating condition.

(1) Adjust the VHF signal generator to exactly 75 megacycles, modulated 95% at 1300 cycles.

(2) Connect the signal generator output to the appropriate receiver antenna connector. Connect the VTVM to the AGC test point E103. Turn both sensitivity controls maximum counter-clockwise (minimum sensitivity condition). Set sensitivity switch to high position.

(3) Set the signal generator output to the level desired for high sensitivity receiver operation, (factory value is 1;000 microvolts). Set the high sensitivity control, R401, to produce -1.5 volts AGC. Observe that the amber light is well lit.

(4) Set the sensitivity switch to the low position. Adjust the signal generator output to the level desired for low sensitivity receiver operation, (factory value is 5;000 microvolts). Set the low sensitivity control, R402, to produce -1.5 volts AGC. Observe proper lamp operation.

(c) Audio Output Setting

(1) Add to the test setup above an audio output meter connected to the receiver's audio output. Disconnect the VTVM.

(2) Adjust the VHF signal generator output to a level 10 times the sensitivity setting in use.

(3) Adjust audio output control, R403, for desired output level up to approximately 150 milliwatts, (factory value is 100 milliwatts).

5.2.3 POWER SUPPLY MODULE

(a) Testing with Receiver Load

With receiver operating normally adjust A+ voltage read at E402 to proper value. Read B+ at E401 (should be approximately 170 volts) and total B+ current drain at E201 (should be 50 to 60 milliamperes). An abnormally heavy B+ load will cause the power supply to start cutting itself off, which gives the appearance of poor voltage regulation at first. That is, as load is increased current drain decreases less rapidly than voltage output. The ratio of these quantities (E over I equals R) gives an equivalent B+ load resistance. Should its value be less than approximately 2300 ohms, trouble shooting will be necessary in the receiver's B+ load circuits.

(b) Testing with no load.

With the RF module and the Audio module removed from the frame, the power supply operation may be checked with no load on the B + output other than R204. Under these conditions B + voltage at E401 should be approximately 200 volts and current drain by the power supply should be approximately 50 milliamperes for the 28 volt unit, and 100 milliamperes for the 14 volt unit. This current may be measured by inserting an ammeter in the A + line leading to the receiver's rear connector P401. The ammeter should initially be set to read at least 1 ampere as the power supply's starting current is considerably greater than the operating values given above.

(c) Repair

Transistor failure most often takes the form of emitter to collector shorting. Blown fuses are an obvious indication of this trouble. Another indication may be obtained by checking the resistance from P201, Pin 12 to ground (Pin 1). For this check the lead of the ohm meter that connects to the positive terminal of the ohm meter's internal battery must be connected to Pin 12. A good power supply will show a resistance greater than 10 ohms. In an improperly fused installation R-205 or R-206 will fracture if its associated transistor shorts.

In replacing transistors use extreme care in soldering to transistor leads to avoid unnecessary heat conduction into the transistor case. Heat sinks on the transistor pins must be used. Low temperature solder (60-40) is advisable. In mounting a transistor insure insulation of the case from the equipment frame as the transistor case is electrically connected to its collector. Although transistors are extremely rugged mechanically they may easily and quickly be destroyed by excessive heat. Internal temperatures greater than approximately 85° C. will destroy most germanium transistors in a small fraction of a second.

5.2.4 RF MODULE

(a) Maximum Sensitivity Test: RF module alignment should seldom be required. It should be attempted only by competent test personnel using proper test equipment according to the procedures given herein. The following test will indicate the module's maximum sensitivity: if insufficient sensitivity is not caused by weak vacuum tubes, Alignment may be undertaken.

(1) Remove DM-3 dust cover. Set sensitivity controls R401 and R-402 full clockwise. Insert proper lamps in test harness and check for compliance with Note 3 of Figure 7-3. Apply power to receiver and allow to warm up for at least five minutes.

(2) Adjust VHF signal Generator to exactly 75 mc, with 95% modulation at 1300 cps.

(3) Select a VTVM scale suitable for measuring -1.5 VDC and connect VTVM to E103 (AGC test point).

(4) Increase signal generator output until -1.5 VDC is obtained on the VTVM. No more than 20 microvolts should be required.

(5) The amber light should be well lit when -1.5 V AGC is obtained. If not there may be trouble in the audio module.

(b) IF Alignment

(1) Remove the six screws securing the RF module to the frame. Remove the module and reconnect using the module extension cable. This allows more convenient access to the IF transformer bottom slugs.

(2) Apply power and check for proper filament operation. Allow at least five mintues' warm-up period before adjusting any tuning slugs.

(3) Make sure both sensitivity controls are full clockwise and the sensitivity switch is on high position.

(4) Select a VTVM scale suitable for measuring -1.5 VDC and connect the VTVM to E103 (AGC test point). Residual AGC voltage(caused by V301B grid current in the absence of signal input) is approximately -0.5 VDC.

(5) Set the IF signal generator to 5.5 mc (no modulation) and connect it to test point E101. Increase signal generator output level until an increase in AGC voltage is noted. If the receiver is considerably misaligned (after transformer replacement, for instance) it may be necessary to temporarily connect the VTVM to audio test point E102 (positive DC) . Voltage appears at E102 before it does at E103.

(6) Adjust T103 secondary (top) for maximum VTVM reading, then T103 primary (bottom), * T-102 secondary, T102 primary, T101 secondary and T101 primary in that sequence. It will be necessary to lower the signal generator output level as tuning.

progress so that the VTVM reading will not exceed -1.5VDC.

* NOTE: The IF transformer slugs have two tuning positions. Choose the outer position (slugs apart) except for the primary slug of T103, which must be tuned at the inner position in order to provide closer coupling.

(7) Repeat step (6).

(8) AGC voltage of -1.5 VDC should be obtained with 80 to 140 microvolts input. AGC voltage of -20VDC should be obtained with no more than 100,000 microvolts input.

(c) IF Trouble-Shooting: If the above specifications cannot be obtained, more detailed checks of the IF strip and the two detectors may be accomplished as follows.

(1) Disconnect primary power from the receiver.

(2) Apply "CONSTANT ONE VOLT" output of IF signal generator (no modulation) to the secondary (terminal C) of T103. With VTVM read E103 voltage (negative DC): it should be 1.1 to 1.2 volts. With VTVM read E102 voltage (positive DC): it should be 1.25 to 1.30 volts.

(3) Apply "CONSTANT ONE VOLT" output of IF signal generator (no modulation) to the primary (terminal A) of T103. With VTVM read E102 voltage (positive DC): it should be 0.4 to 0.6 volts.

(4) Apply primary power to the receiver and allow at least a five minute warm-up.

(5) Apply IF signal generator output (variable level, no modulation) to 5654 grids in the sequence given below and adjust signal level to read 1.5 volts (positive DC) with VTVM at E102. Signal level required should be approximately as indicated.

Grid; 2nd IF (V104-1)	50,000 uv
Grid; 1st IF (V103-1)	700 uv
Grid; Mixer (V102-1)	20 uv

(d) Oscillator Alignment

(1) Allow the receiver to warm up for at least five minutes.

(2) Select a VTVM scale suitable for measuring -5VDC and connect the VTVM to E104 (oscillator test point).

(3) Adjust L106 for maximum VTVM reading, which should be -2.5 ± 0.5VDC.

(4) Adjust L106 for a slightly higher frequency by rotating the screw counter-clockwise enough to cause the VTVM reading to decrease approximately 0.1 volt from its peak.

(e) RF Coil Alignment

(1) Select a VTVM scale suitable for measuring -1.5VDC and connect the VTVM to E103.

(2) Connect the VHF signal generator to the receiver and adjust the generator to exactly 75 mc (no modulation). Increase generator output level until an increase in AGC voltage is noted.

(3) Adjust L104, L103, L102, and L101, in that order, for maximum VTVM reading. It will be necessary to lower signal generator output level as tuning progresses so that the VTVM reading will not exceed -1.5VDC.

(4) Repeat step (3).

(f) Final Alignment: All previous IF adjustments must now be rechecked to allow for small variation in Y101 frequencies and for errors in IF signal generator frequency. Using the immediately preceding set-up, continue as follows.

(1) Check the accuracy of the VHF signal generator's 75 mc output again (no modulation).

(2) Recheck the tuning of T103 top and bottom, T102, and T101, in that order, for maximum.

(3) IF Step 2 resulted in considerably higher sensitivity, peak L104, L103, L102, and L101 again.

(4) Apply 95% modulation at 1300 cps to the VHF signal generator. The amber lamp should light with approximately 10 microvolts input to the receiver. (This is the "Maximum Sensitivity Test" of 5.2.4 (a)).

(5) Check the maximum lamp sensitivity (minimum RF input required to operate lamps) at 400 cps and at 3000 cps. All three sensitivities should be essentially the same.

(6) Determine that blocking doesn't occur by selecting a VTVM scale suitable for measuring - 50VDC and observing each lamp operation, in turn, with the VHF signal generator output set at 200,000 microvolts.

(7) In order to obtain an idea of overall strong-signal performance, turn the modulation off and increase RF signal input level to 350,000 microvolts. The AGC voltage produced should be -18 volts or more.

5. 2.5. AUDIO MODULE

Operational checking of the audio module in the receiver is dependent on operation of the remainder of the receiver. If previous specifications of section 5.2 have been met (including the audio output specifications of section 5.2.2 (c), the bench test procedure of section 5.1.3 will isolate possible circuitry troubles to the circuit of V302B and the audio module transistors. Should any given lamp obtain insufficient voltage, its transistor lamp amplifier may require replacement with a unit of higher amplification. Suitable transistors (specially selected to DARE specifications) are available from DARE. Should one of the indicating lamps remain lit at all times, its transistor is shorted from emitter to collector. Transistor replacement should be handled with extreme care as outlined in section 5.2.3 (c).

Compliance with note 3 of Figure 7-3 is essential to obtaining proper lamp voltages. This should be checked in every case.

MAINTENANCE

TABLE 5-1 VOLTAGE AND RESISTANCE

Tube Symbol	Res. and D.C.V.	Tube Pin Numbers								
		1	2	3	4	5	6	7	8	9
V101	V.D.C.	-2.5	0	0	+6.5	+175	+65	+0.6		
	Ohms	500K	0	0	3	20K	22K	100		
V102	V.D.C.	-1.7	+0.8	0	+6.5	+105	+80	+0.8		
	Ohms	100K	100	0	5	30K	45K	100		
V103	V.D.C.	-0.2	+1.2	+7.2	+13.6	+110	+86	+1.2		
	Ohms	100K	180	9	12	30K	45K	180		
V104	V.D.C.	-0.2	+2.4	+13.6	+20	+130	+114	+2.4		
	Ohms	320K	470	12	15	30K	45K	470		
V105	V.D.C.	+6.5	+1.3	+.02	+122	0	+124	0	+1.4	+12.7
	Ohms	3	180	45K	30K	0	30K	0	180	6
V301	V.D.C.	+18.5	-0.6	0	+13.4	+13.4	+180	+18	+42.5	+20
	Ohms	350K	220K	0	8	8	120K	650K	12K	10
V302	V.D.C.	+180	0	+4.5	+21	+21	+160	0	+5.5	+27.5
	Ohms	20K	240K	470	10	10	20K	240K	1.2K	12

TEST CONDITIONS

1. Normal loads connected to receiver but no RF signal input.
2. R401, R402, and R403 turned full clockwise.
3. Voltages measured with respect to chassis using a DC VTVM.
4. Resistances measured to chassis using a 20,000 ohm/volt meter.

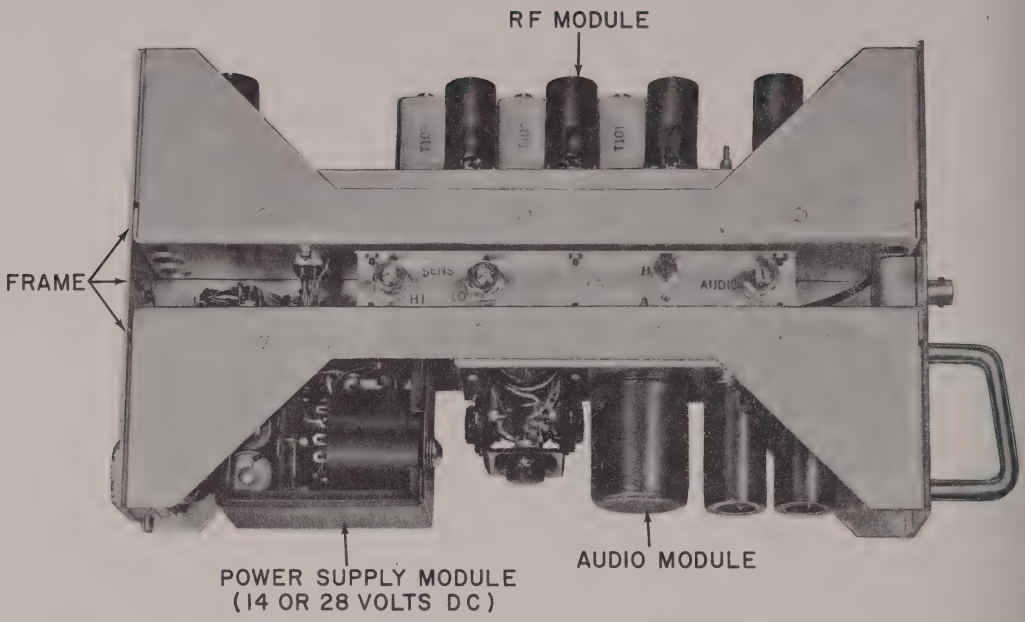


Figure 6-1 DARE Marker Beacon Rec. DM-3, Dust cover removed.

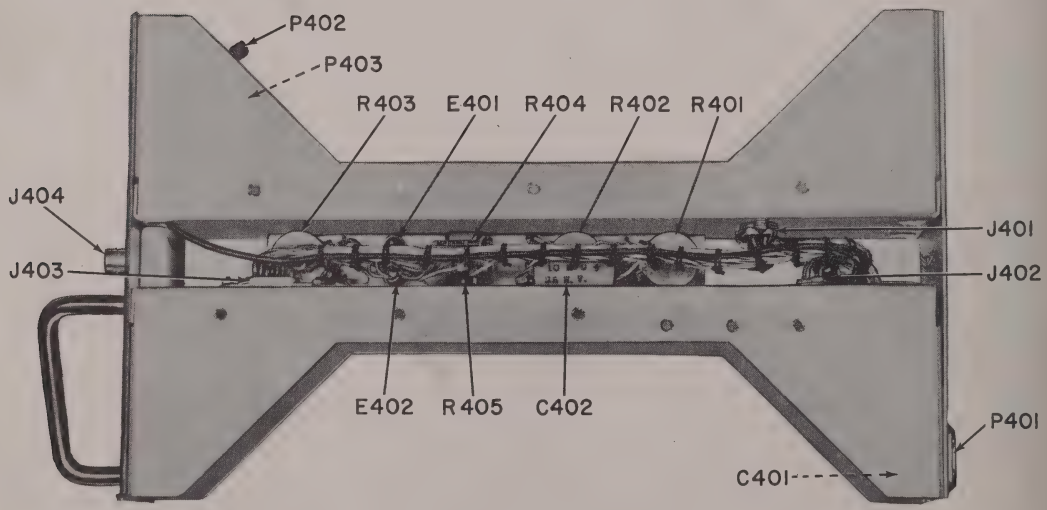


Figure 6-2 DARE Marker Beacon Rec. DM-3, Frame

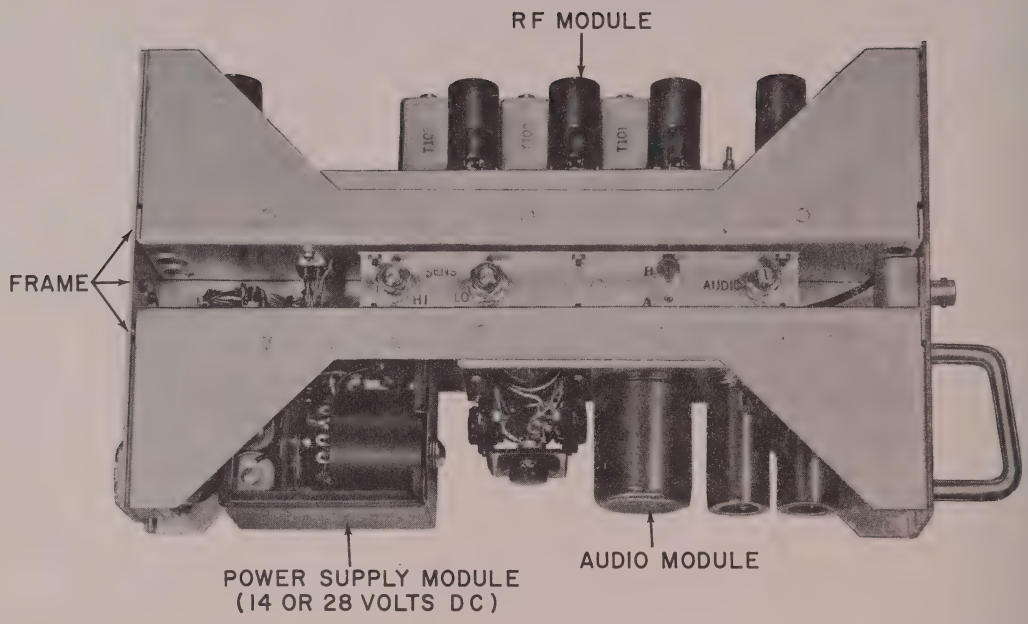


Figure 6-1 DARE Marker Beacon Rec. DM-3, Dust cover removed.

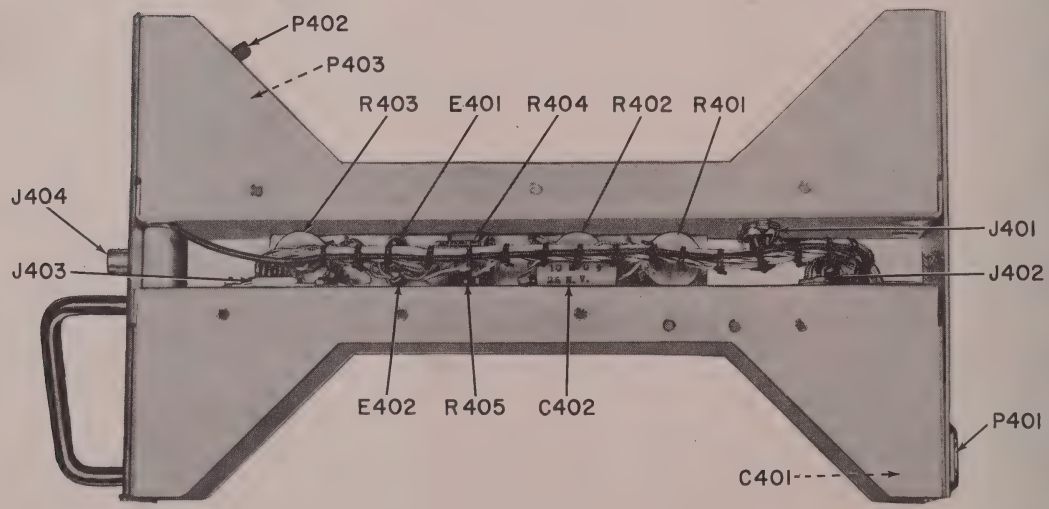
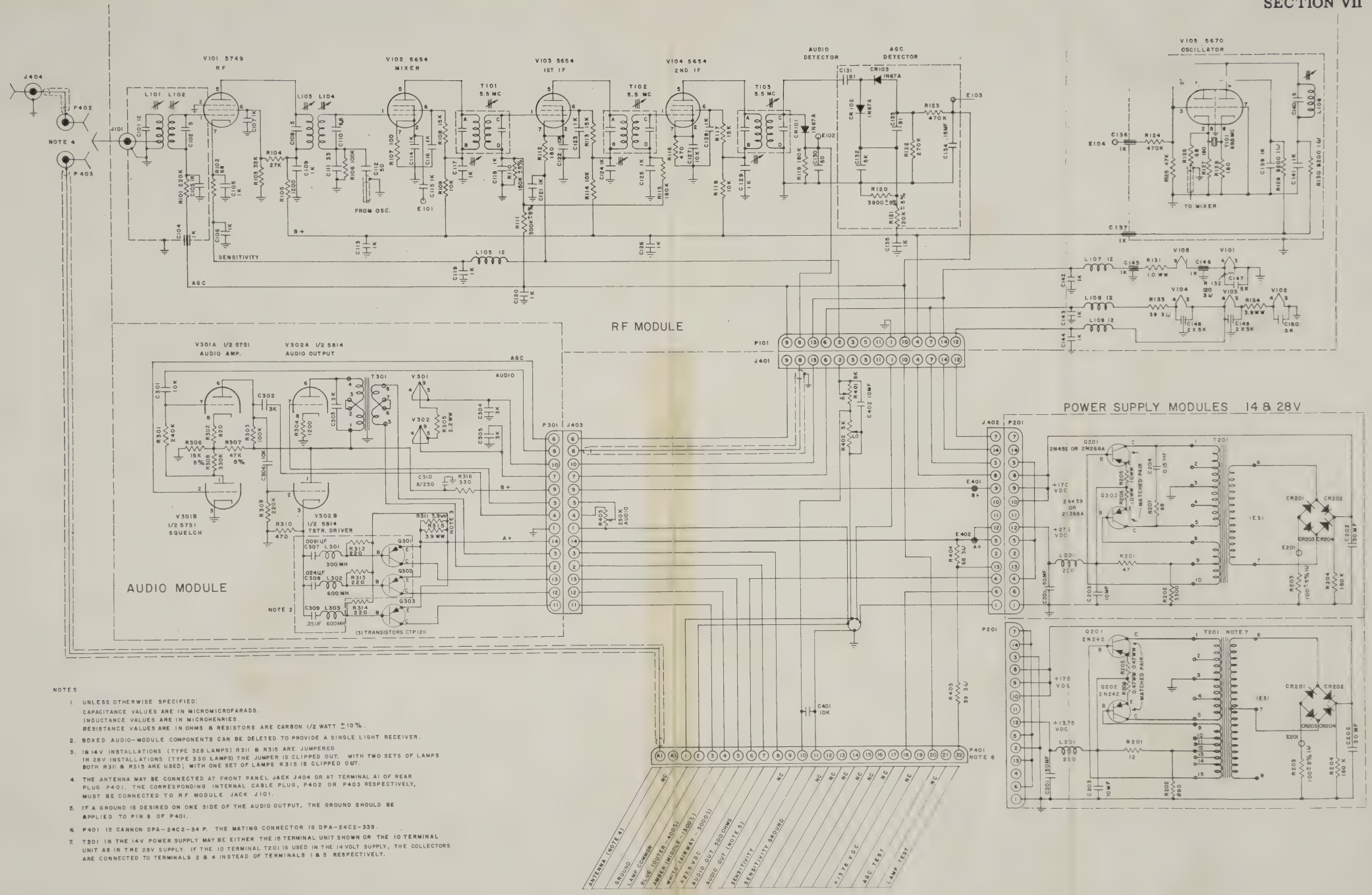


Figure 6-2 DARE Marker Beacon Rec. DM-3, Frame



NOTES

1. UNLESS OTHERWISE SPECIFIED:
   CAPACITANCE VALUES ARE IN MICROMICROFARADS.
   INDUCTANCE VALUES ARE IN MICROHENRIES.
   RESISTANCE VALUES ARE IN OHMS & RESISTORS ARE CARBON 1/2 WATT ±10%.
2. BOXED AUDIO-MODULE COMPONENTS CAN BE DELETED TO PROVIDE A SINGLE LIGHT RECEIVER.
3. IN 14V INSTALLATIONS (TYPE 328 LAMPS) R311 & R315 ARE JUMPERED
   IN 28V INSTALLATIONS (TYPE 330 LAMPS) THE JUMPER IS CLIPPED OUT. WITH TWO SETS OF LAMPS
   BOTH R311 & R315 ARE USED; WITH ONE SET OF LAMPS R315 IS CLIPPED OUT.
4. THE ANTENNA MAY BE CONNECTED AT FRONT PANEL JACK J404 OR AT TERMINAL A1 OF REAR
   PLUG P401. THE CORRESPONDING INTERNAL CABLE PLUG, P402 OR P403 RESPECTIVELY,
   MUST BE CONNECTED TO RF MODULE JACK J101.
5. IF A GROUND IS DESIRED ON ONE SIDE OF THE AUDIO OUTPUT, THE GROUND SHOULD BE
   APPLIED TO PIN 8 OF P401.
6. P401 IS CANNON DPA-24C2-34 P. THE MATING CONNECTOR IS DPA-24C2-33S.
7. T201 IN THE 14V POWER SUPPLY MAY BE EITHER THE 15 TERMINAL UNIT SHOWN OR THE 10 TERMINAL
   UNIT AS IN THE 28V SUPPLY. IF THE 10 TERMINAL T201 IS USED IN THE 14 VOLT SUPPLY, THE COLLECTORS
   ARE CONNECTED TO TERMINALS 2 & 4 INSTEAD OF TERMINALS 1 & 5 RESPECTIVELY.

Figure 7-3 DARE Marker Beacon Rec. DM-3, Overall schematic

DM-3 PARTS LIST

Part Symbol Number	PART Number	Description
	102-000-320D	MAIN FRAME ASSEMBLY
C-401	16N103MA5	CAPACITOR, fixed .01 mfd disc. ceramic ± 20% 500 VDCW
C-402	Type TD	CAPACITOR, fixed 10 mfd Electrolytic 25 VDCW
E-401	105-602	Test Jack B +
E-402	105-607	Test Jack A +
J-401	57-10140	Connector, amphenol
J-402	57-10140	Connector, amphenol
J-403	57-10140	Connector, amphenol
J-404	UG-290A/U	Connector, coaxial UG-290A/U
P-401	DPA-24C2-34P	Connector, cannon
R-401	IRC-6157686	Resistor, variable 5K ohm, inverse log taper, carbon
R-402	IRC-6157686	Resistor, variable 5K ohm, inverse log taper, carbon
R-403	IRC-6157705	Resistor, variable 250K ohm, log taper, carbon
R-404	GM 6801	Resistor, fixed 68 ohm 3 W 10%
R-405	GM 3901	Resistor, fixed 39 ohm 3 W 10%

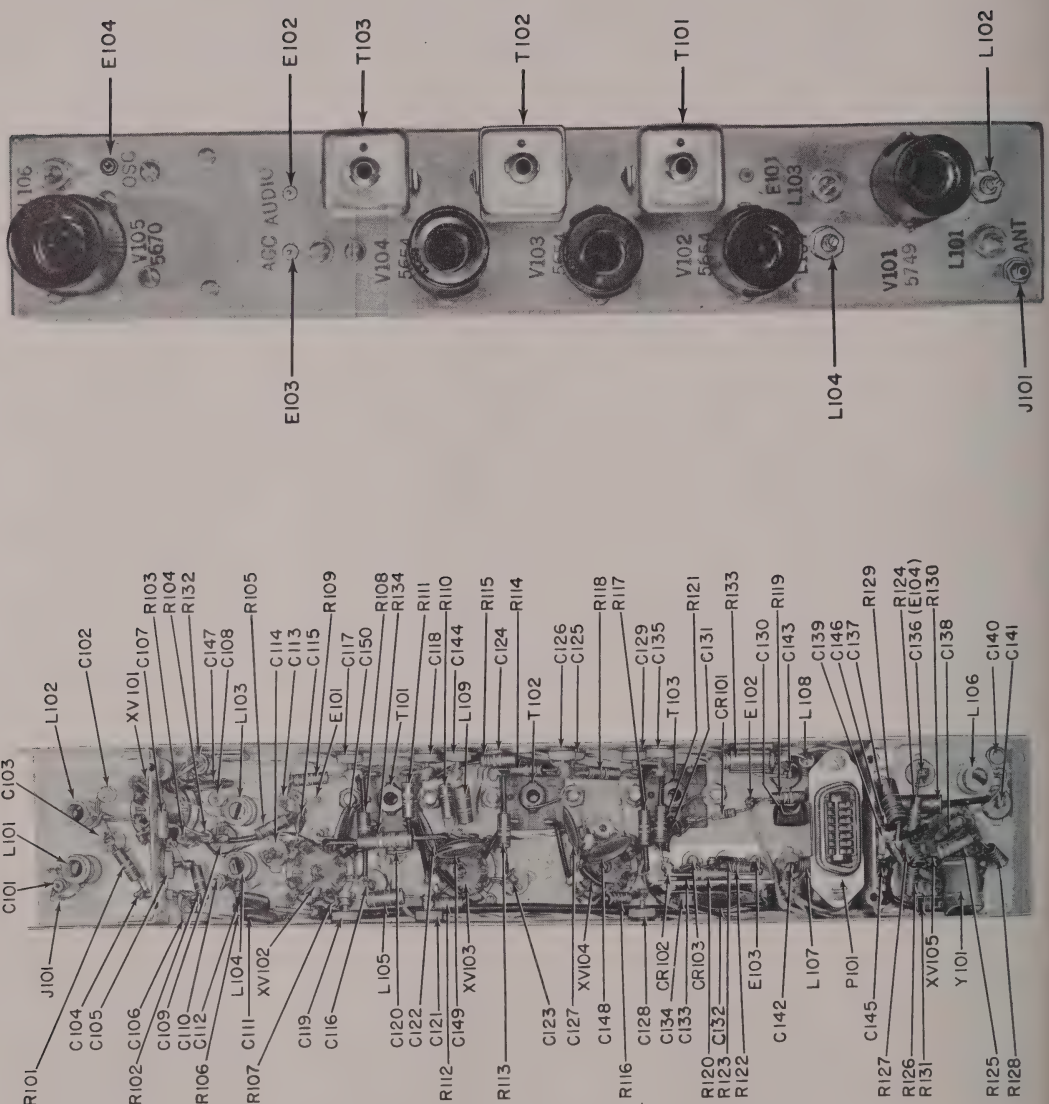


Figure 6-3 DARE Marker Beacon Rec. DM-3, RF Module, Top View

Figure 6-4 DARE Marker Beacon Rec. DM-3, RF Module, Bottom View

DM-3 PARTS LIST

Part Symbol Number	Part Number	Description
	102-600-319D	RF MODULE
C-101	TCZ-12	CAPACITOR, fixed 12 mfd NPO 600 VDCW
C-102	TCZ-5	CAPACITOR, fixed 5 mmfd NPO 600 VDCW
C-103	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-104	SA-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-105	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-106	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-107	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-108	TCZ-5	CAPACITOR, fixed 5 mmfd NPO 600 VDCW
C-109	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-110	TCZ-6R8	CAPACITOR, fixed 6.8 mmfd NPO 600 VDCW
C-111	DM15-330J	CAPACITOR, fixed 33 mmfd ± 5% NPO 500 VDCW
C-112	DM15-500J	CAPACITOR, fixed 50 mmfd ± 5% NPO 500 VDCW
C-113	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-114	So4-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-115	16E102MA6	CAPACITOR, fixed .001 mfd disc. ceramic ± 20% 600 VDCW
C-116	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW

DM-3 PARTS LIST

Part Symbol Number	Part Number	Desc
C-117	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-118	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-119	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-120	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-121	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-122	16N103MA5	CAPACITOR, fixed .01 mfd disc. ceramic ± 20% 500 VDCW
C-123	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-124	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-125	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-126	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-127	16N103MA5	CAPACITOR, fixed .01 mfd disc. ceramic ± 20% 500 VDCW
C-128	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-129	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-130	DM15-500J	CAPACITOR, fixed 50 mmfd ± 5% NPO 500 VDCW
C-131	DM15-910J	CAPACITOR, fixed 91 mfd ± 5% NPO 500 VDCW
C-132	17E502MA10	CAPACITOR, fixed .005 mfd disc. ceramic * 20% 1000 VDCW

DM-3 PARTS LIST

Part Symbol Number	Part Number	Description
C-133	DM15-910J	CAPACITOR, fixed 91 mmfd ± 5% NPO 500 VDCW
C-134	337Y154K	CAPACITOR, fixed .15 mfd ± 10% 150 VDCW
C-135	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-136	SA-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-137	SA-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-138	DM15-500J	CAPACITOR, fixed 50 mmfd ± 5% NPO 500 VDCW
C-139	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-140	TCZ-5	CAPACITOR, fixed 5 mmfd NPO 600 VDCW
C-141	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-142	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-143	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-144	S04-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-145	SA-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-146	SA-102-2	CAPACITOR, fixed .001 mfd button ceramic -10 +20% 500 VDCW
C-147	17E502MA10	CAPACITOR, fixed .005 mfd disc ceramic ± 20% 1000 VDCW
C-148	16E502MB6	CAPACITOR, fixed 2X.005 mfd disc ceramic ± 20% 600 VDCW
C-149	16E502MB6	CAPACITOR, fixed 2X.005 mfd disc ceramic ± 20% 600 VDCW

DM-3 PARTS LIST

Part Symbol Number	Part Number	Description
C-150	17E502MA10	CAPACITOR, fixed .005 mfd disc ceramic ±20% 1000 VDCW
CR-101	1N67A	CRYSTAL DIODE 1N67A
CR-102	1N67A	CRYSTAL DIODE 1N67A
CR-103	1N67A	CRYSTAL DIODE 1N67A
J-101	27-9	CONNECTOR,, ANTENNA AMPHENOL
L-101	271-000-025A	COIL, ANTENNA (Special)
L-102	271-000-026A	COIL, RF (Special)
L-103	271-000-026A	COIL, RF (Special)
L-104	271-000-026A	COIL, RF (Special)
L-105	10102-34	CHOKE, 12 microhenry
L-106	271-000-026A	COIL RF (Special)
L-107	10102-34	CHOKE, 12 microhenry
L-108	10102-34	CHOKE, 12 microhenry
L-109	10102-34	CHOKE, 12 microhenry
P-101	57-20140	CONNECTOR, AMPHENOL
R-101	EB 2241	RESISTOR, fixed 220K ohm ½W 10%
R-102	EB 6801	RESISTOR, fixed 68 ohm ½W 10%
R-103	EB 3331	RESISTOR, fixed 33K ohm ½W 10%
R-104	EB 2731	RESISTOR, fixed 27K ohm ½W 10%
R-105	EB 1221	RESISTOR, fixed 1200 ohm ½W 10%
R-106	EB 1041	RESISTOR, fixed 100K ohm ½W 10%

DM-3 PARTS LIST

Part Symbol Number	Part Number	Description
R-107	EB 1011	RESISTOR, fixed 100 ohm ½W 10%
R-108	EB 1531	RESISTOR, fixed 15K ohm ½W 10%
R-109	EB 1031	RESISTOR, fixed 10K ohm ½W 10%
R-110	EB 1545	RESISTOR, fixed 150K ohm ½W 5%
R-111	EB 3045	RESISTOR, fixed 300K ohm ½W 5%
R-112	EB 1811	RESISTOR, fixed 180 ohm ½W 10%
R-113	EB 1531	RESISTOR, fixed 15K ohm ½W 10%
R-114	EB 1031	RESISTOR, fixed 10K ohm ½W 10%
R-115	EB 1841	RESISTOR, fixed 180K ohm ½W 10%
R-116	EB 4711	RESISTOR, fixed 470 ohm ½W 10%
R-117	EB 1531	RESISTOR, fixed 15K ohm ½W 10%
R-118	EB 1031	RESISTOR, fixed 10K ohm ½W 10%
R-119	EB 1841	RESISTOR, fixed 180K ohm ½W 10%
R-120	EB 3925	RESISTOR, fixed 3900 ohm ½W 5%
R-121	EB 1245	RESISTOR, fixed 120K ohm ½W 5%
R-122	EB 2741	RESISTOR, fixed 270K ohm ½W 10%
R-123	EB 4741	RESISTOR, fixed 470K ohm ½W 10%
R-124	EB 4741	RESISTOR, fixed 470K ohm ½W 10%
R-125	EB 4731	RESISTOR, fixed 47K ohn ½W 10%
R-126	EB 6801	RESISTOR, fixed 68 ohm ½W 10%
R-127	EB 1811	RESISTOR, fixed 180 ohm ½W 10%
R-128	EB 1811	RESISTOR, fixed 180 ohm ½W 10%
R-129	GB 8221	RESISTOR, fixed 8200 ohm 1W 10%
R-130	GB 8221	RESISTOR, fixed 8200 ohm 1W 10%
R-131	IRC Type BW½	RESISTOR, fixed 1 ohm ½W 10%

DM-3 PARTS LIST

Part Symbol Number	Part Number	Description
R-132	GM 1211	RESISTOR, fixed 120 ohm 3W 10%
R-133	GM 3901	RESISTOR, fixed 39 ohm 3W 10%
R-134	IRC BW½	RESISTOR, fixed 3.9 ohm ½W 10%
T-101	C-0047449	TRANSFORMER 5.5 mc IF.
T-102	C-0047449	TRANSFORMER 5.5 mc IF.
T-103	C-0047449	TRANSFORMER 5.5 mc IF.
V-101	5749	TUBE, Electron Type 5749
V-102	5654	TUBE, Electron Type 5654
V-103	5654	TUBE, Electron Type 5654
V-104	5654	TUBE, Electron Type 5654
V-105	5670	TUBE, Electron Type 5670
Y-101	M-20	CRYSTAL, Quartz 69.5 meg.

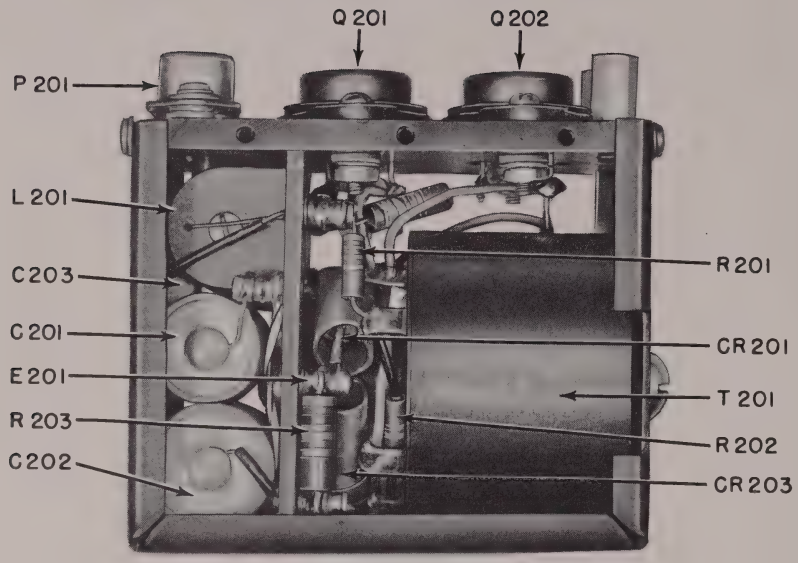


Figure 6-5 DARE Marker Beacon Rec. DM-3, P. S. Module, right side view

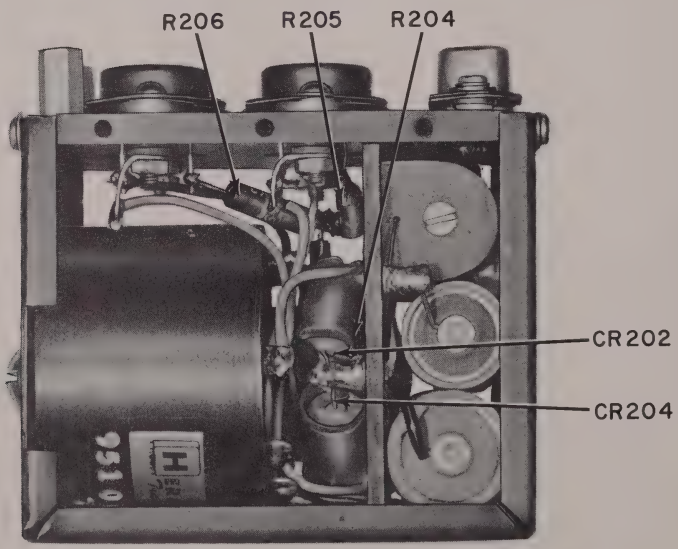


Figure 6-6 DARE Marker Beacon Rec. DM-3, P. S. Module, left side view

SECTION VI
POWER SUPPLY
14V & 28V

DM-3 AND DGS-20 PARTS LIST

Part Symbol Number	Part Number	Description
	102-000-318C	POWER SUPPLY 28V
	102-000-317C	POWER SUPPLY 14V
C-201	Type TD	CAPACITOR, fixed 50 mfd Electrolytic 50VDC
C-202	Type TD	CAPACITOR, fixed 30 mfd Electrolytic 250VDC
C-203	I.E.I.	CAPACITOR, fixed 10 mfd Electrolytic 50VDC
C-204	337Y154K	CAPACITOR, fixed 0.15 mfd ± 10% 150 VDC
CR-201	1ES1	RECTIFIER, Silicon Diode
CR-202	1ES1	RECTIFIER, Silicon Diode
CR-203	1ES1	RECTIFIER, Silicon Diode
CR-204	1ES1	RECTIFIER, Silicon Diode
P-201	57-20140	CONNECTOR, Amphenol
Q-201		TRANSISTOR, 2N459 or 2N268A 28VDC
Q-202		TRANSISTOR, 2N459 or 2N268A 28VDC
Q-201		TRANSISTOR, 2N242 14VDC
Q-202		TRANSISTOR, 2N242 14VDC
R-201	EB-4701	RESISTOR, fixed 47 ohm ½ W 10% 28VDC
R-201	EB-1201	RESISTOR, fixed 12 ohm ½ W 10% 14VDC
R-202	EB-3321	RESISTOR, fixed 3300 ohm ½ W 10% 28VDC
R-202	EB-1821	RESISTOR, fixed 1800 ohm ½ W 10% 14VDC
R-203	GB-1015	RESISTOR, fixed 100 ohm 1 W 5%
R-204	EB-1541	RESISTOR, fixed 150K ohm ½ W 10%
R-205	Type BW	RESISTOR, fixed 1 ohm ½ W 10% 28VDC
R-206	Type BW	RESISTOR, fixed 1 ohm ½ W 10% 28VDC
R-205	Type BW	RESISTOR, fixed .47 ohm ½ W 10% 14VDC
R-206	Type BW	RESISTOR, fixed .47 ohm ½ W 10% 14VDC
R-207	EB-6801	RESISTOR, fixed 68 ohm ½ W 10% 28VDC
T-201	260-000-005B	TRANSFORMER (Special)

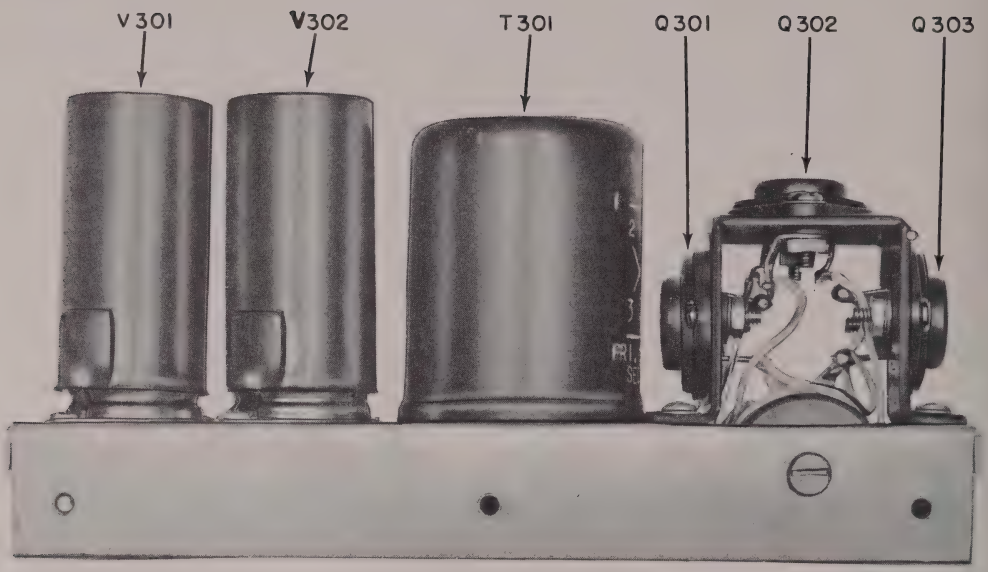


Figure 6-7 DARE Marker Beacon Rec. DM-3, Audio module, side view

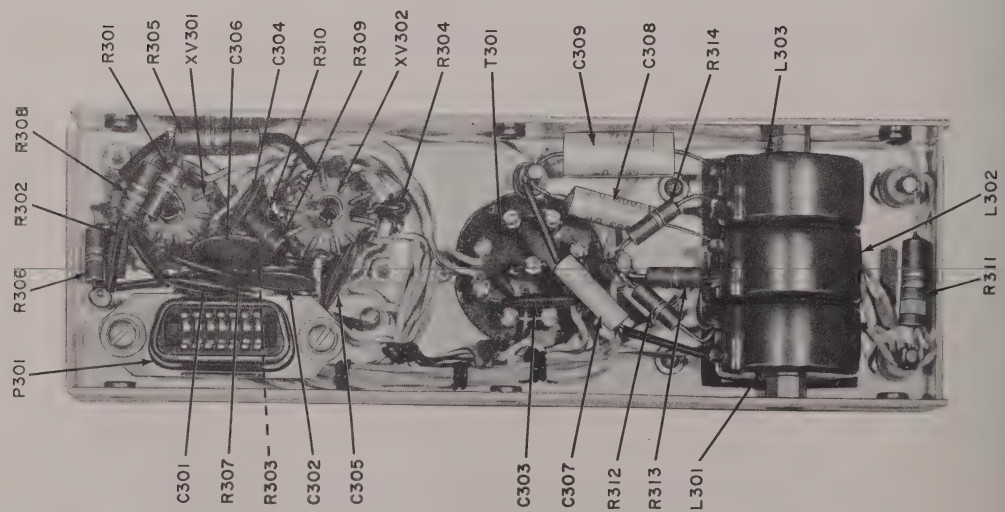


Figure 6-8 DARE Marker Beacon Rec. DM-3, Audio module, bottom view

DM-3 PARTS LIST

Part Symbol Number	Part Number	Description
	102-000-321C	AUDIO
C-301	16N103MA5	CAPACITOR, fixed .01 mfd disc. ceramic ± 20% 500 VDCW
C-302	16E302MA6	CAPACITOR, fixed .003 mfd disc. ceramic ± 20% 600 VDCW
C-303	16E302MA6	CAPACITOR, fixed .003 mfd disc. ceramic ± 20% 600 VDCW
C-304	16E302MA6	CAPACITOR, fixed .003 mfd disc. ceramic ± 20% 600 VDCW
C-305	16E302MA6	CAPACITOR, fixed .003 mfd disc. ceramic ± 20% 600 VDCW
C-306	16N103MA5	CAPACITOR, fixed .01 mfd disc. ceramic ± 20% 500 VDCW
C-307	Type 663UW	CAPACITOR, fixed .0094 mfd mylar ± 5% 200 VDCW
C-308	Type 663UW	CAPACITOR, fixed .025 mfd mylar ± 5% 200 VDCW
C-309	Type 663UW	CAPACITOR, fixed .079 mfd mylar ± 5% 200 VDCW
L-301	MP-206-24B	CHOKE 300 millihenry
L-302	MP-206-28B	CHOKE 600 millihenry
L-303	MP-206-35B	CHOKE 2 henry
P-301	57-20140	CONNECTOR, Amphenol
Q-301		TRANSISTOR, Special 2N257
Q-302		TRANSISTOR, Special 2N257
Q-303		TRANSISTOR, Special 2N257

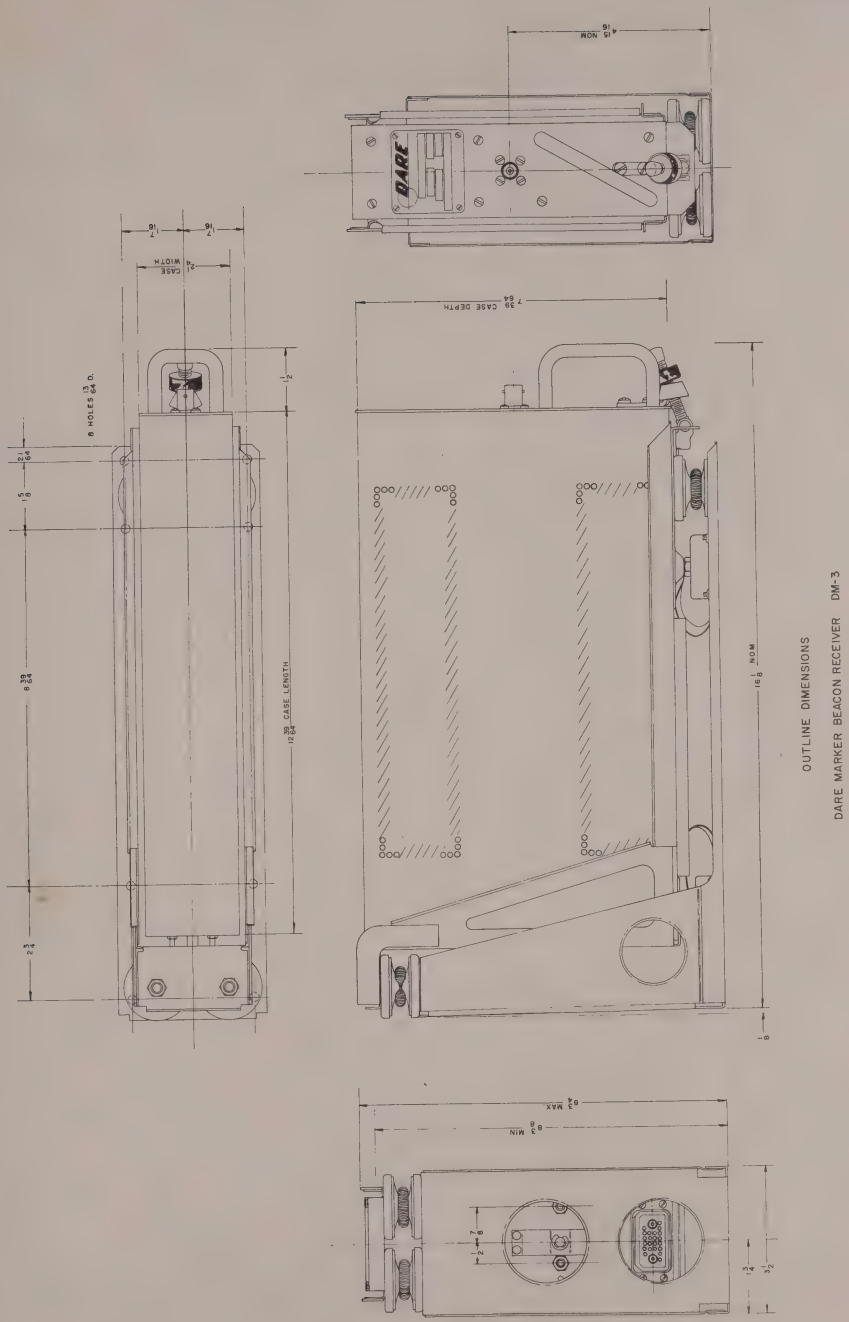


Figure 7-1 DARE Marker Beacon Rec. DM-3, Outline and installation details

DM-3 PARTS LIST

Part Symbol Number	Part Number	Description
R-301	EB 2445	RESISTOR, fixed 240K ohm ½W 5%
R-302	EB 8211	RESISTOR, fixed 820 ohm ½W 10%
R-303	EB 1041	RESISTOR, fixed 100K ohm ½W 10%
R-304	EB 1221	RESISTOR, fixed 1200 ohm ½W 10%
R-305	IRC BW½	RESISTOR, fixed 2.2 ohm ½W 10%
R-306	EB 1535	RESISTOR, fixed 15K ohm ½W 5%
R-307	EB 4735	RESISTOR, fixed 47K ohm ½W 5%
R-308	EB 3341	RESISTOR, fixed 330K ohm ½W 10%
R-309	EB 2241	RESISTOR, fixed 220K ohm ½W 10%
R-310	EB 4711	RESISTOR, fixed 470 ohm ½W 10%
R-311	IRC BW½	RESISTOR, fixed 3.9 ohm ½W 10%
R-312	EB 2211	RESISTOR, fixed 220 ohm ½W 10%
R-313	EB 2211	RESISTOR, fixed 220 ohm ½W 10%
R-314	EB 2211	RESISTOR, fixed 220 ohm ½W 10%
R-315	IRC BW½	RESISTOR, fixed 3.9 ohm ½W 10%
T-301	T-55208	TRANSFORMER, Audio
V-301	5751	TUBE ELECTRON TYPE 5751
V-302	5814	TUBE ELECTRON TYPE 5814

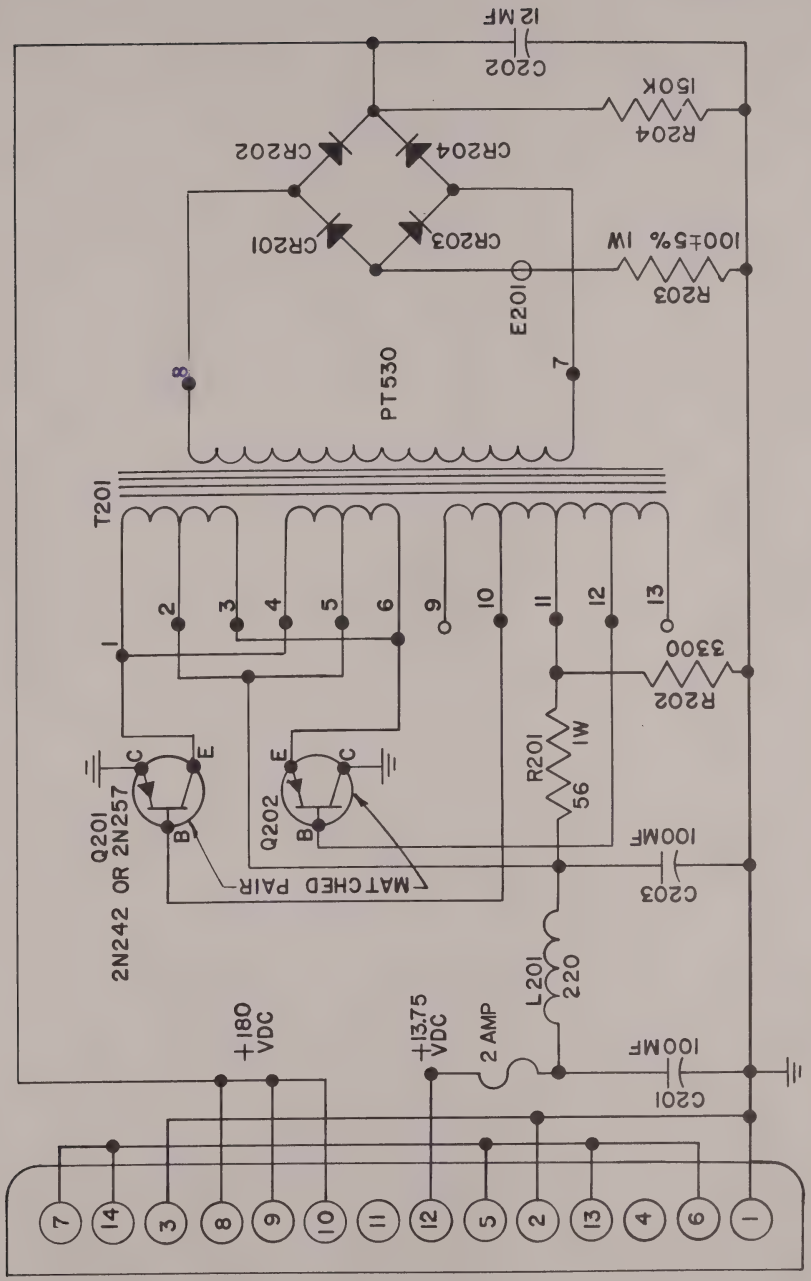


Figure 7-4 Power Supply - 14 Volts - DARE DM-3
Starting with Serial Number 424

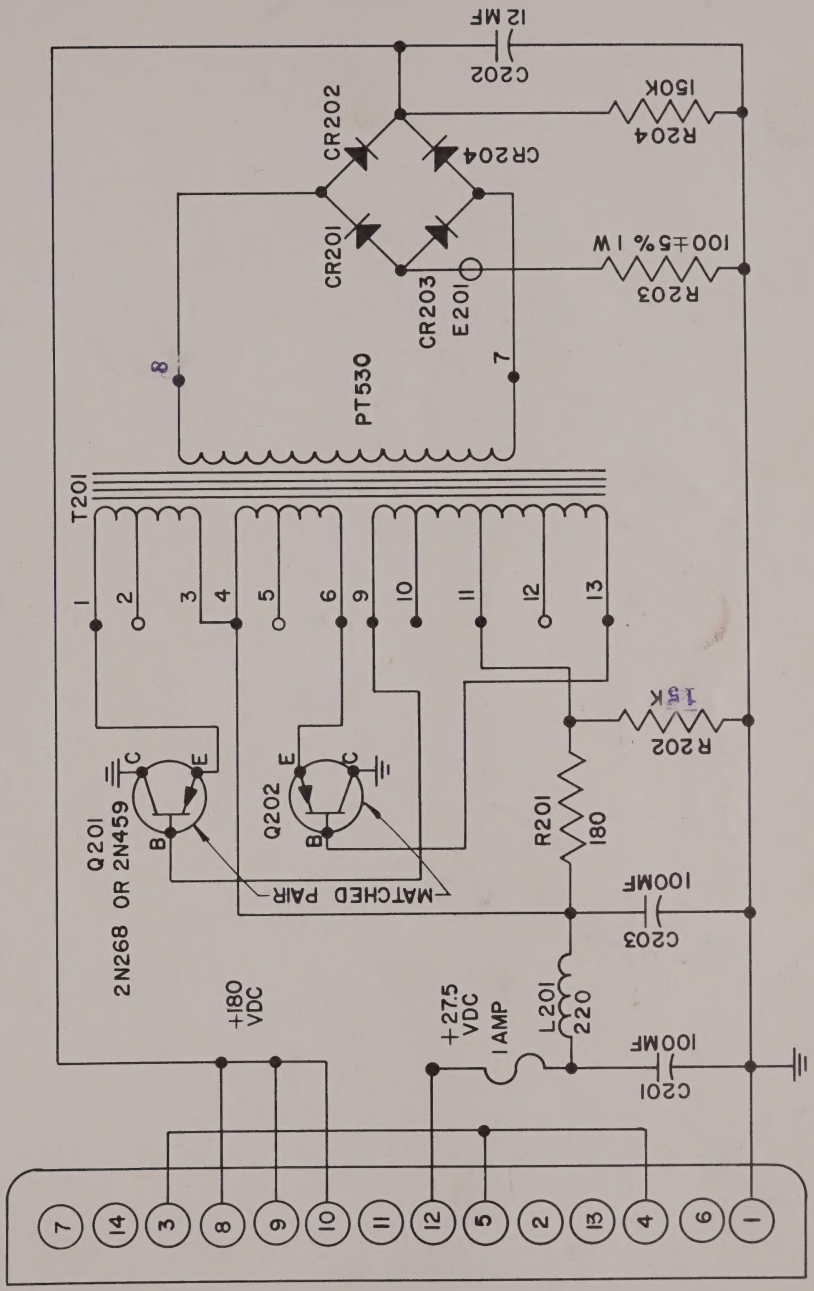


Figure 7-5 Power Supply - 28 Volts - DARE DM-3
Starting with Serial Number 424